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Private Forestry in Norway— A Case Study in Small Woodland Management and Policy

By
JOHN A. ZIVNUSKA

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Private Forestry in Norway— A Case Study in Small Woodland Management and Policy

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IMPROVING THE MANAGEMENT of small woodland properties represents a major challenge for American forestry in the years ahead. In the most comprehensive study of the timber situation in the United States yet attempted, the U. S. Forest Service (1958) has shown that the major part of the commercial forest land of the nation is in small private holdings and that generally forest conditions on such holdings are poorer than those found on other private or public holdings.

This difficulty in developing good management on forests in small holdings has been encountered in practically all nations in which conscious programs of improving forest management have been adopted. The reasons are both numerous and interrelated. They include such factors as: (1) the incidental or accidental nature of many such ownerships, (2) an assumed level of potential returns which does not appear to justify the investment in knowledge and time required for effective management, (3) an income level of many such owners which does not enable any form of capital investment program, (4) a lack of markets for the small and low grade materials which often form the main part of such forests, and (5) a lack of adequate marketing institutions for reaching the markets which do exist.

The development of appropriate management techniques for small woodlands and of economic institutions conducive to such management must be developed in terms of the specific conditions of particular areas and regions. However, analysis of the experience of other nations in meeting this general problem can be useful in evaluating the possible consequences of various procedures in the domestic situation. The study presented here was undertaken as one such case study in small woodland management and policy.

The Problem and its Setting

Norway is well suited to a case analysis of small woodland forestry. Norwegian forestry shares fully in the main stream of European forestry thinking, yet the area is sufficiently limited and homogeneous to be covered by a study of limited duration. Forests are the dominant form of productive land use in the nation, while the forest

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industries play a major role in both the domestic economy and the export trade.

With four-fifths of its forest area privately owned, Norway has a higher percentage of its forest land in private ownership than any of the other leading nations in forest products. These private forests are predominantly in small holdings, firmly established in Norwegian tradition and law. Under these conditions Norwegian foresters, administrators, and legislators have come to realize that, to a degree perhaps not surpassed elsewhere, the development of good forest management is an important national problem that must be solved primarily in a context of small holdings.

Norway—the land and its forests. Norway is a narrow, elongated nation stretching up the western side of the Scandinavian peninsula from the 58th to the 71st degree of north latitude. The total land area is 76.4 million acres, of which approximately one-fourth lies within the Arctic Circle. It is typically a heavily glaciated country of mountains and high plateaus cut by more or less narrow valleys. Only one-fifth of the country lies lower than 500 feet elevation.

The climate is greatly influenced by the tempering effects of the Gulf Stream, which has enabled the growing of potatoes and barley north of the Arctic Circle (The Royal Agricultural Society of Norway, 1951) and has led to the natural establishment of the most northerly evergreen forests in the world. Nevertheless, nearly three-fourths of the nation's land has little or no productive use. The major land categories are summarized in Table 1. The 2.0 million acres of cultivated land and the 0.6 million acres of natural meadows are far surpassed by the 18.5 million acres of forest land.

The entire area of 18.5 million acres, which includes 13.0 million acres of coniferous forest and 5.5 million acres of hardwood forest, is reported as "productive forest" in official statistics. However, about 3.5 million acres of the hardwoods represent either polar birch forests or birch forests above the coniferous timber line (Langsaeter, 1953). Such forests have a very low rate of growth and are used mainly to supply local fuel. Thus there are about 15.0 million acres of what might be termed "commercial forest land."

The general nature of the forests can be illustrated by data from the national forest surveys (Langsaeter, 1949). The gross volume of timber (excluding bark) for the entire forest area is estimated as 11,407 million cubic feet, of which 53 percent is spruce (*Picea abies*), 28 percent pine (*Pinus sylvestris*), and 19 percent birch (*Betula alba*) and other hardwood species. The volume of annual growth is estimated

TABLE 1. Land categories in Norway.[1]

Category	Area in million acres	Percent of total land area
Towns	0.2	0.3
Cultivated land	2.0	2.6
Natural meadows	0.6	0.7
Forest land	18.5	24.3
(Coniferous forest)	(13.0)	(17.0)
(Hardwood forest)	(5.5)	(7.3)
Other land	55.1	72.1
Total land area	76.4	100.0

[1]Source: Statistisk Sentralbyra, 1954, 1955.

at 369 million cubic feet, with 56 percent spruce, 24 percent pine, and 20 percent hardwoods. As these data suggest, Norwegian forestry is centered around spruce, with pine being in an important secondary position. Only limited use has been made of the hardwood species other than as local fuel. Typically spruce is found on the better sites and pine on the poorer sites, with a mixture of the two occurring on intermediate sites. The average volume of the spruce stands is 443 cubic feet per acre, which is roughly double the average for pine and nearly eight times that of the hardwoods. The timber is characteristically small, with only 9 percent of the volume of spruce, 16 percent of pine, and 6 percent of hardwoods being in trees larger than 11.8 inches d.b.h.

The coniferous timber extends up to about 2,500 feet in elevation in eastern Norway, to about 1,500 feet in the region around Trondheim, and only a little above sea level at its northern limits. Commonly a belt of birch extends from 300 to 500 feet above the coniferous timber line. The most extensive commercial forest area is in the rolling terrain of eastern Norway which has 62 percent of the coniferous volume; Trøndelag ranks second with 16.5 percent; and southern Norway is third with 14.5 percent.

Forests in the Norwegian economy. The population of Norway (as of January 1, 1954) is estimated at 3,375,870 residents, of whom 68 percent live in the rural districts and 32 per cent in towns and cities (Statistisk Sentralbyrå, 1955). The resulting population density of 28 persons per square mile is by far the lowest of any of the European nations.

The basic natural resources for the support of this predominantly rural and scattered population are the sea, the land, the mineral deposits, and the water power. The sea sustains major fisheries with an annual catch of more than one million tons and an important whaling industry. These ties to the sea also lie behind Norway's large merchant marine, with a fleet ranking third in tonnage among the nations of the world. The mineral industries include sulphur pyrites, iron, copper, zinc, and lead. Coal is limited to a small field on the island of Svalbard. The water power potential is estimated at more than 10,000,000 kilowatts, of which only one-fifth has been developed. In this situation the forests, which are the dominant productive form of land use, have become a primary source of raw materials. The development of forest industries has been facilitated by the ready availability of water transportation for logs and the necessary power for the manufacturing processes.

The average annual cut of roundwood from the forests during the four year period 1949-50 to 1952-53 was estimated at 383.4 million cubic feet distributed among the following categories (Statistisk Sentralbyrå, 1955):

	Percent
Coniferous timber for sale	68.9
Hardwood timber for sale	0.5
Coniferous fuelwood for sale	3.3
Hardwood fuelwood for sale	2.3
Wood consumed on farms	25.0

The estimate that 25 percent of the roundwood cut is consumed on farms for fuel, fences, hewn log structures, and other purposes is some indication of the importance of forests to the Norwegian farms. Actually, forests play a major role in the agricultural economy of the nation. Farm woodlands include 48 percent of the total forest area of 18.5 million acres (Statistisk Sentralbyrå, 1954). In 1939 67 percent of all farms with more than 2.5 acres of cultivated land had woodland areas; for farms with more than 25 acres of cultivated land the proportion was 92 percent. With forest work tending to be concentrated in the winter, these farm forests have been of great economic importance to farmers in enabling a better utilization of labor in addition to being an important source of income (The Royal Agricultural Society of Norway, 1951).

The 69 percent of the cut represented by coniferous timber for sale goes almost

TABLE 2. Production of selected forest products in Norway, 1953.[1]

Product	Production in 1953
Lumber (millions of board feet)	738
Total wood pulp (thousands of short tons)	1,180
Mechanical pulp	581
Sulfite pulp	503
Sulfate pulp	96
Total paper and board (thousands of short tons)	622
Newsprint paper	178
Other paper	304
Paperboard	47
Hardboard	52
Insulating board	41

[1]Source: Food and Agriculture Organization of the United Nations, 1954.

entirely to the lumber and the pulp and paper industries. The proportion of the wood going to the pulp and paper industry has been increasing steadily over the years and is now the larger share of the total. It is estimated that in 1949 the lumber industry used 45 percent of the commercial wood, while mechanical pulp took 20 percent and chemical pulp 35 percent (Matheson, 1952). The 1953 production of these industries is shown in Table 2.

The lumber industry is characterized by small and very small production units. It is estimated that in 1946-47 Norway had 65 frame (gang) sawmills, 2,475 double circular sawmills, and 5,159 single circular sawmills (Eriksen, 1952). The annual output of the 65 frame sawmills was about the same as that of the circular mills combined.

The pulp and paper industry includes a much smaller number of units. In 1952 Norway had 17 mechanical pulp mills with a combined capacity of more than 600,000 tons, 16 sulfite mills with a total capacity somewhat less than 600,000 tons, 6 sulfate mills with a total capacity of about 100,000 tons, and 51 paper and board mills with a combined capacity of approximately 550,000 tons (Nossen, 1953). With very few exceptions, however, these pulp and paper mills must be considered small production units in contrast with typical North American installations.

Due to its general economic circumstances, the development of a large export trade is essential to Norway. In this respect the pulp and paper industry is of particular significance to the nation. Pulp and paper products have consistently represented 25 percent or more of the total value of Norwegain exports, reaching a high of 30 percent in 1951. In contrast, the lumber output is largely consumed domestically, with only 7 percent of production being exported in 1949. Thus lumber exports have fluctuated at a little more than 1.5 percent of the total value of exports in recent years.

The direct importance of forest products to the Norwegian standard of living is indicated clearly by the high level of domestic consumption of such products (Food and Agriculture Organization of the United Nations, 1954). Norway leads all other European nations in its rate of lumber consumption, with a 1949-1953 average annual consumption of 212 board feet per capita. Among the nations of the world only Canada (284 board feet per capita)

and the United States (250 board feet per capita) have higher rates. In the consumption of wood pulp and pulp products Norway ranks fifth with a per capita rate of 147 pounds, following the United States (282 pounds), Sweden (178 pounds), Canada (171 pounds), and Finland (165 pounds).

Ownership of forest land. The ownership of forest land in Norway is summarized in Table 3. Individual holdings, generally limited in size, constitute 71 percent of the forest area, while private holdings of all types form 80.6 percent of the total.

Farm forests are a major element in this pattern. A special study in 1949 showed 8.9 million acres of farm forests on 131,886 farm units (Statistisk Sentralbyrå, 1954). This represents 48 percent of the total forest area and 60 percent of the private forests. The average size of these farm forests is 67.5 acres. In contrast it may be noted that in the United States an estimated 3.4 million farm forests averaging 48.8 acres in size form 34 percent of the commercial forest area and 52 percent of the private holdings of such land (U. S. Forest Service, 1958).

The strength of the tradition of small ownerships and proprietor-management in Norway is indicated by the results of the Agricultural Census of 1939 which showed that 92 percent of the farmers owned the land they tilled and that nearly 80 percent of the farms had been in the possession of the family for more than 20 years (The Royal Agricultural Society of Norway, 1951). The alodial rights and the rights of succession which underlie this pattern can be traced back to the oldest laws of the nation. The basic legislation in this field which is now in effect was adopted in 1821 (*Lov angående Odels- og Åsetesretten av 26 juni 1821*). Under the laws of succession the eldest son has the right to take over the farm at a reasonable price. If he does not wish to do so, the next eldest son has the right, and so on. If the farm is sold outside the family, another member of the family with the aloidal right can take

TABLE 3. Ownership of forest land in Norway.[1]

Ownership class	Areas in thousands of acres	Percent of total forest area
Public		
National government	1,887	10.2
Church	176	.9
Government forests used by rural districts	560	3.0
Municipal forests used by rural districts	439	2.4
Communes	551	3.0
Total	3,613	19.5
Private		
Foundations	37	0.2
Cooperative ownerships	171	1.0
Companies	1,562	8.4
Individuals	13,148	71.0
(Residing in district)	(11,632)	(62.8)
(Residing in other districts)	(1.516)	(8.2)
Total	14,918	80.6
Total, all ownerships	18,532	100.0

[1]Source: Statistisk Sentralbyra, 1954.

it back within a three-year period upon payment of a price fixed in the district. In the event of a sale outside the family, there are provisions giving residents of the district priority in purchase rights over nonresidents.

Another aspect of the Norwegian land philosophy is shown by the "Jordloven" of 22 June 1928. Under this law a farmer who needs additional land to make a balanced farm of his holdings and who is not able to arrange a private purchase from adjacent land holdings may be able to obtain the land through condemnation proceedings. The application for this must be supported by the district land board and approved by the Minister of Agriculture.

Under these and additional laws land ownership and transfers of ownership are closely controlled in Norway. There appears to be no possibility of "blocking up" large forest properties through purchase of small holdings. The existing large landholders find it impossible to add to their holdings. Indeed, under present trends the possibility appears greater that there will be a further breaking up of ownership units rather than the opposite. Thus the problems of forest management in Norway must be considered as fixed in a context of land ownership dominated by small private holdings.

The problem of small woodland management. The opportunities and pressures for the expansion of forest products output in Norway are great. Domestic consumption is rising, while the opportunities for further expansion of the export trade appear highly promising. In this situation the wood supply has become the limiting factor. The annual growth of all materials is estimated at 369 million cubic feet, while the average annual cut for the period 1949-50 to 1952-53 was 383 million cubic feet. While these simple statistics contain the elements of a problem, they appear actually to understate greatly the difficulties of the present timber situation.

An analysis of the forest situation presented by the Forest Director of Norway may be taken as representative of the official viewpoint (Langsaeter, 1952). This analysis shows that, although total growth is estimated at 369 million cubic feet, only 321 million cubic feet of growth is both usable and accessible. Furthermore, it is held that due to shortages in the younger age classes and other problems even such an amount cannot be cut annually over the next 20 to 30 years. A cut limited to about 293 million cubic feet is indicated as appropriate. A partial solution to the deficit in meeting the current wood requirements which this would involve is suggested through such measures as providing access to forests now inaccessible, increasing the use of sawmill residues, reducing the use of coniferous fuelwood, and expanding the use of hardwoods. Even with allowance for these possibilities a deficit of around 40 million cubic feet is indicated.

Although there may be some debate concerning the exact details of such analyses, the general nature of the forestry problem facing Norway is clear and generally recognized. The forests and forest industries form a fundamental and major segment of the national economy. It is essential that output in this area be maintained and, if at all possible, increased. This can be achieved only through improved forest management and a substantial increase in growth. Physically, an increase in growth of at least 50 percent is considered to be a conservative estimate of possibilities. The problem is to realize this potential in practice. In approaching this problem a forest ownership pattern dominated by small individual holdings is accepted as a fixed element in the institutional environment. Thus Norway must solve the problem which has proven to be peculiarly difficult in most nations—the development of intensive forest management on small woodlands.

In the following analysis of the methods which are being developed to meet this problem, the discussion will center around two major phases. First, consideration will be given to the type of management con-

sidered appropriate for small properties. This discussion will include the silvicultural background of Norwegian forestry, the system of inventories and working plans used in regulating the forest, and the operational problems that appear to be involved. Second, consideration will be given to the policy problems involved in developing an institutional setting which it is hoped will lead to intensive management without significant change in the firmly established institution of small private landholdings. Here the discussion will cover regulatory measures, marketing arrangements, financial institutions, and provisions for technical advice and assistance. The final section of the analysis will summarize the discussion.

The Silvicultural Background

The development of more intensive forest management and increased forest growth involves both technical and economic problems. These problems fall into the two general areas of silviculture and forest management. The silvicultural aspects—the biological considerations of reproduction and growth—establish the frame of reference within which management must organize the forest area to meet the income needs and capital situation of the owner. Accordingly, consideration will be given first to the silvicultural approach to small woodland management in Norway.

The discussion will be limited to the primary coniferous forest regions. The problems of the extensive birch forests found in many parts of the country, of the hardwood types of southern Norway, and of the coniferous plantations of the west coast will not be considered. While these problems are interesting and important to the future economy of Norway in their own right, it is the primary coniferous forests which are the basic element of the nation's forest economy.

The historical experience. Both the present condition of the forests and the concepts of good forest management held by Norwegian foresters are the products of past experience in the handling of the forests. Thus, to understand the present efforts in forest management it is necessary to review this historical experience.

Exploitation of the Norwegian forests for various purposes extends back to antiquity. During the sixteenth century two uses became predominant: use for fuel in smelting of metals in connection with the expanding mining industry and use for sawlogs as the lumber industry expanded following the development of water-powered sawmills. The mining use led to heavy cuttings, often in the form of clear cuttings, sometimes causing forest devastation but often resulting in excellent regeneration. Use for sawlogs, on the other hand, was based on the largest and best quality trees. Logging for this purpose tended to be a dimension cutting or diameter-limit cutting — a process of selecting and cutting the largest trees on the basis of immediate financial returns.

The last few decades of the nineteenth century brought a rapid expansion of the wood industries accompanied by a similar expansion in diameter-limit cutting. With the expansion of the lumber industry, the development of the pulp industry, and the reduction in available timber of the largest sizes, such diameter-limit cutting became increasingly heavy.

This same period brought an expanding interest in forest management, which culminated in 1898 with the establishment of the Norwegian Forest Society and the admission of the first students to the new program of professional forestry education at the Agricultural College of Norway.

The newly established profession appears to have been greatly influenced by developments in the central European countries. This was generally a period of reaction against the rigid, even-aged systems of forest management and the emergence of influential schools of silvicultural thought emphasizing selection management. In Germany the work of Christoph Wagner and the new "Dauerwald" system of management were centers of interest, while in

France and Switzerland the *methode du controle* system and the work of Biolley played a similar role. Under the leadership of Professor Agnar Barth this philosophy of selection management dominated the thinking of Norwegian foresters during the first twenty years of this century.

During this period there was a pronounced swing away from clear cutting and toward an intensification of the diameter-limit type of cutting. Silvicultural management under the selection system was introduced on some forests, but generally the actual cutting appears to have been primarily a selective cutting of trees on a short run financial basis rather than a selection cutting of trees on a silvicultural basis. However, these two approaches, although basically different, are superficially similar and there appears to have been fairly common confusion of the two methods much as has occurred in other nations including the United States.

Unfavorable results of the heavy dimension cutting soon began to appear. The remaining trees developed a fuller foliage, giving an impression of productivity which was not borne out by the actual growth. Such forests have been vividly described as "the green lie" (Skinnemoen, 1949, 1952). Frequent failure to establish satisfactory regeneration led to a similarly descriptive term, "the childless forests" (Holand, 1951).

By the early 1920's a group of younger foresters had risen to challenge the entire approach to forest management in Norway. Leaders of this group included Professor Erling Eide, director of the Norwegian Forest Research Institute since 1921, W. Opsahl, J. G. Juul, and O. Haslund. Although the worst results were due to dimension cutting, these men challenged the entire approach of selection management and advocated the use of even-aged silvicultural methods.

A prolonged, sharp, and at times bitter controversy developed. There was little room for neutral ground or compromise. Advocacy of even-aged or uneven-aged management involved emotional reactions as well as scientific debate.

Certain general developments had a strong influence on the outcome. The rapid expansion of the pulp industry provided an active market for smaller trees and logs. This was facilitated by improvements in transportation, primarily through various engineering works in the floating streams and rivers. Under these conditions a shift from dimension cutting became increasingly feasible in financial terms.

The first national forest survey also had an important influence. This survey was started in 1919 and the results were published in full in 1933. As the results began to be available, they provided striking statistical evidence of the poor condition of much of Norway's forest area. In particular, they showed that the actual growth of the generally irregular stands was very much less than the potential indicated by the yield tables for even-aged stands.

With the adoption of the Forest Protection Law of 1932 and the completion of the first national forest survey in 1933 it was clear that the advocates of even-aged silviculture had gained the dominant position in Norwegian forestry. Although there is still a small group of foresters who argue that selection management has a useful place in the spruce and pine forest types, the general opinion of foresters is that even-aged management is the best method for obtaining a high level of production from these forests.

This outcome does not appear to be based on any controlled research studies comparing the yield of carefully managed selection forests with carefully managed even-aged forests. Instead, the comparison is of the yield of good even-aged stands with the yield of actual irregular stands resulting from dimension cutting, often carried out without any conscious efforts at good forest management. In addition, the case for even-aged management is supported by studies of the silvical characteristics of the species.

In this connection, it is important to note that foresters dealing with broadly similar conditions in Sweden and Finland have also concluded that even-aged management should generally be used in these forests. Throughout this important forest region the evidence is clear that even-aged silviculture can give satisfactory regeneration of forests and high rates of growth for the sites. Against this demonstrated effectiveness of even-aged management, the possible effectiveness of good selection management is not generally considered an important question. Silvicultural research is concerned primarily with the problems of improving the details of even-aged management.

Thus from this historical experience Norwegian foresters have come to general agreement that the silvicultural improvement of small woodland management can be obtained best through even-aged systems.

Present silvicultural practices. The details of silvicultural practice are not the concern of this study. However, a brief consideration of certain general tendencies is necessary in the development of the silvicultural background of small woodland management. The practices discussed in this section are those typical of areas receiving good management. One of the objectives of Norwegian forest policy is the extension of such practices to additional areas.

The general goal of silvicultural practices is the development of well-stocked, even-aged stands of desirable species composition. This means spruce on the good sites, a mixture of spruce and pine on the average sites, and pine on the poor sites. One of the undesirable results of dimension cutting has been the spread of spruce on the poorer sites. Although spruce brings a higher price per unit of volume than pine, its poor development on the poor sites make it less desirable than pine on such areas.

The usual practices are clear cutting in spruce and clear cutting with seed trees in pine. The pattern of clear cutting in the spruce varies with the topography and natural conditions. Block cutting is fairly common and in some instances strip cutting has been used. Considerable use is made of expansion of clear cuttings through use of a progressively advancing edge. There is a strong tendency to use heavy preparatory thinnings before making the clearcutting and some interest in the possibilities of expanding the use of shelterwood cuttings.

The leaving of pine seed trees is so well established as to have a strong traditional element. Such seed trees are sometimes left even on areas which are regenerated by planting or seed spotting. Pine seed trees are left not only in the pine types but also in the mixed types. The more shade-tolerant spruce is aggressive in the regeneration of such areas and the seed trees are considered necessary to maintain pine in the new stand.

Both natural and artificial methods of stand regeneration are used. Differences in climatic conditions and in soil types result in wide differences in the possibilities of obtaining natural regeneration in the various areas. However, as a generalization it can be said that planting (or seed spotting) is necessary on the best and poorest sites, while natural regeneration is generally possible on the central range of sites. The necessity for planting the best sites is due primarily to the problem of weed competition (especially various grasses), but also to some extent to a sense of the importance of ensuring rapid and full regeneration of these highly productive areas.

Planting is ordinarily done with 2-2 stock produced in a well-established and expanding nursery program. Except in occasional years with prolonged dry periods in the spring, the plantations generally have high survival. With pine, seed spotting is used under some conditions instead of planting, also with a high degree of success.

With natural regeneration there is considerable stress placed on the importance of

obtaining very uniform and well spaced seedlings. Advance regeneration may be cleared out in order to favor a uniform new stand. Cleanings and early non-commercial thinnings to increase the uniformity of the new stands are advocated, but apparently are practiced to only a limited extent even on the well managed properties.

Problems of soil health and humus formation are major factors in the silvicultural practice. Control of the light on the forest floor is an important element in preparation of areas for regeneration. Screefing and discing to expose mineral soil are sometimes used. In the pine areas fire is also used occasionally in site preparation, primarily to reduce competition and remove a portion of the humus. However, it should be mentioned that even after a fire it is ordinarily necessary to chop through the remaining humus layer with a hoe in order to reach mineral soil for seed spotting or planting.

The proper timing of regeneration cutting in established even-aged stands is a common source of debate among foresters. The problem, however, is almost entirely financial rather than biological. A much more difficult and more controversial problem is the regeneration of irregular stands. Here the considerations are both biological and economic. In general, the pattern of development to be expected from such stands is not clearly established, although the development under certain conditions has been the subject of recent investigations (Braathe, 1953). To this is added the financial uncertainties of balancing prospective returns from a continuance of the existing stand against the possibilities of higher but more distant returns from an early conversion of the stand to even-aged stocking. When regeneration cuttings for such conversion are made there are considerable difficulties in determining the exact methods to be followed. In general it can be said that such areas provide the most difficult test of the forester's silvicultural skill and financial judgment.

Another major element in the system of even-aged management is the development and carrying out of an adequate program of thinnings. This is important both to obtain full utilization of the yield of the stand and to concentrate the growth on the better trees. The importance of thinnings in Norwegian forestry is indicated by the experience on several well managed large properties on which from 40 to 45 percent of the present cut is in the form of thinnings, the balance coming from harvest cuttings. With the generally excellent markets for small materials, practically all such thinnings are made on a commercial basis.

It is usually desired to repeat the thinnings every 3 to 5 years, using the shorter interval in the earlier thinnings and longer intervals as the stand develops. There is considerable emphasis on developing uniform spacing in the thinnings, but the thinning regimes are not arbitrary. Conceptually, the usual thinning practice might be termed selection thinning. However, in practice the marking in spruce emphasizes low thinning, while in pine the extent of crown thinnings is somewhat higher.

Ditching and draining of water-logged forest areas are also important in silviculture. This, however, is a rather specialized field. Research and experience now provide a good basis for decisions as to which areas are promising for such work. The guidance of consultants in this field is generally considered advisable before undertaking any large programs.

In summary, it can be said that the present silvicultural practices characteristic of good even-aged management in Norway require detailed control by skilled and experienced foresters. Certain phases of the operations, such as marking for thinnings in many cases, are of a routine character and are delegated to experienced assistants. However, the more difficult problems such as the handling of the irregular stands are usually under the direct

supervision of professional foresters. Characteristically the degree of detailed silvicultural control by graduate foresters in well managed Norwegian forests is much higher than that ordinarily found on either public or private forests considered to be well managed in the United States.

Significance to small woodland management. Silvicultural practices are best exemplified in the management of the larger forest properties in Norway. On these larger properties there is every indication that this silvicultural approach is leading to well managed and productive forests. There are also some impressive examples of such management on small properties. However, the challenging question for the future of Norway's forests is whether or not such silvicultural methods can be generally applied to the small woodlands.

It has often been argued that the owner's need for continuous rather than periodic income makes even-aged management difficult to achieve on small properties. The owners themselves have tended to use some type of selective cutting. While the results of such dimension cutting based on immediate financial returns may be a progressive degrading of the stands and a failure to utilize fully the growth potential of the sites, it is a type of cutting which can meet the financial needs of the owner over a considerable period of years. Recognizing this, foresters in many regions have attempted to improve small woodland management through the progressive replacement of dimension cutting by silvicultural selection, even in instances in which the silvical characteristics of the species do not appear wholly favorable for uneven-aged management.

In Norway, however, the prevailing silvicultural thought requires a radical shift in the organization of forestry operations and the general system of management on a great many properties. The problem is not simply that of the eventual suitability of even-aged management to small properties which must produce a continuous income to meet the needs of the owners. In addition, the problem must be faced immediately of sustaining an income from the property for the owner during the prolonged and complex process of converting irregular stands to an even-aged, managed condition.

After many decades of dimension cutting (frequently without any conscious effort to organize the properties for permanent management) the present condition of much of the area is found to be far removed from the normal stands of even-aged management. The situation is shown clearly by the results of the second national forest survey, which has been completed in five of the *fylker*[1] which are especially important as forest regions (Langsaeter, 1949). Briefly, the results show that in these *fylker* only a little more than half of the forest area is in a condition which can be brought directly into a system of even-aged management. More than 40 percent of the total forest area is either so irregular or sparse in stocking that the stands will not be able to utilize the productive capacity of their sites in the future. As has been discussed, the conversion of these stands to a well-stocked, even-aged condition is recognized as a peculiarly difficult silvicultural and economic problem. In addition, on the areas with satisfactory stocking there is a pronounced deficiency of the younger age classes.

The technical problems of converting such forests to even-aged management are difficult at best. They are made the more complex by the necessity of working with small holdings. It is significant that in a nation in which small woodlands are of

[1]For administrative and political purposes Norway is divided into 18 *fylker*, each of which is an electoral district for the *Storting* (national parliament) and has a governor appointed by the King. These units are frequently termed "counties," but actually they represent a form of political subdivision which does not have a direct parallel in the United States. Accordingly the Norwegian term (*fylke*, sing.; *fylker*, pl.) will be used here.

basic importance the challenge of developing intensive even-aged management on small holdings has been accepted.

Working Plans and Forest Management

In Norway as in most European countries the written working plan is considered a primary tool in the development of permanent forest management. On the larger properties a general working plan is prepared for the entire area, under which more detailed working plans are established for each of the districts into which the property is divided. Operating experience is reviewed, new inventory data are compiled, and the working plan is revised and rewritten at periodic intervals, usually each ten years.

Few of the small woodlands have such written working plans. It can also be said that few of the small woodlands are operated under the conditions of permanent and productive forest management. Since 1942 the Norwegian Forest Society has been carrying out a program for the development of working plans for farm forests, while more recently certain of the District Sales Associations of the Norwegian Forest Owners' Association have also become active in this field. At present serious consideration is being given to requiring by law the preparation of a written working plan for each forest property in Norway.

For this study the working plan will be taken as the instrument for analyzing the technical approach to the improvement of forest management on small woodlands within the silvicultural frame of reference discussed in the preceding section. It epitomizes the efforts to balance silvicultural financial, and operating problems in improving the management of the property.

The use of cutting classes. Theoretical analyses of even-aged management are usually developed in terms of the individual age classes. However, for the practical problem of developing improved forest management in irregular and unmanaged stands the use of separate age classes involves a number of difficulties. The individual age class implies a degree of uniformity of stand conditions not ordinarily found nor entirely necessary in forests in the early stages of management. Much more important, however, is the fact that the condition of the stand depends not only on its age and site but also upon its past treatment. As a result of past treatments it will be found that stands of the same age and site may differ greatly in the condition of the trees and in the positions for which they are best suited in the management of the forest.

Due to these factors Norwegian foresters generally believe that the use of age classes is not appropriate to their present problems. Instead, they make use of a system of cutting classes which is designed both to simplify procedures by reducing the number of classes which must be used and to be more meaningful in terms of actual operating conditions.

The most common system of cutting classes includes six different classes. Five of these classes are basic components of the managed forest which is desired, while the sixth is a stand condition which will be progressively eliminated as management improves. The classes are defined as follows (Langsaeter, 1949; Vigerust, 1949):

> *Cutting Class I:* Forest under regeneration; all areas in which satisfactory regeneration cuttings have been made but in which regeneration is not yet fully established.
>
> *Cutting Class II:* Young stands below thinning age; reproduction and young forests, with or without shelter trees forming an overstory, but below the size at which thinnings can be made under the conditions of the locality.
>
> *Cutting Class III:* Young stands which should be thinned; young stands with satisfactory stocking in which the cubic volume per unit area is increasing rapidly and in which thinnings should be or are being carried out. Also includes uneven-aged for-

ests with a high proportion of the younger age-classes.

Cutting Class IV: Older stands not yet ready for regeneration cutting; middle-aged or older forest in which the current annual growth continues to be higher than the average annual growth. Also includes uneven-aged forests with approximate equality between younger and older age-classes or with some surplus of the older classes.

Cutting Class Va: Mature stands ready for regeneration cutting; stands with an average stocking of 60 percent or higher in which growth has declined due to age.

Cutting Class Vb: Stands of every age, so sparse, damaged, or irregular that in the future they will be unable to utilize the yield capacity of the habitat.

Although Cutting Classes Va and Vb represent distinctly different conditions, they are classified as subdivisions of a single class since both include stands in which regeneration cuttings should be made.

The collection of data on the distribution of the forests by cutting classes is one of the major elements in the second national forest survey begun in 1937. This information is considered highly valuable in determining the present condition of the forest, in enabling long term calculations concerning the national cutting budget, and in planning for the increase of forest production.

This system is also used in the preparation of most working plans for individual properties. However, there is a tendency to use more detailed classifications on properties which have been under management for some time. In a few cases in which the stands have been brought fairly close to a regulated condition, the working plans have been shifted to an age-class basis.

Thus, the system of cutting classes seems to be in a sense a transition system. Its particular usefulness appears to lie in the period in which irregular stands are being brought into a regulated, even-aged condition. While the system appears to have been developed to meet the problems of this transition period, this should not be taken to imply that there is any general tendency to shift to the use of age-classes as soon as possible. Instead, the general thinking appears to be that the cutting classes have many practical advantages and that this general approach, perhaps somewhat modified and refined, will be useful for many years.

All of the problems of regulation of the cut, description of the normal forest, and similar matters can be and are expressed in terms of cutting classes in a manner exactly parallel to the usual age-class calculations. The use of the less precise classes, of course, involves less precision in the calculations.

The general problem for technical forest management is indicated clearly by the cutting class data which have been compiled for the *fylker* (Ostfold, Akershus, Vestfold, Hedmark, and Nord-Trøndelag) in which the second national forest survey has been completed (Langsaeter, 1949). The percentage distribution of forest area by cutting classes is summarized and compared with the normal distribution in the following tabulation:

Class	*Actual (percent)*	*Normal (percent)*
I	3	6
II	3	31
III	17	28
IV	27	28
Va-Vb	50	7

The data on Class V are divided between Va and Vb only in Vestfold and Nord-Trøndelag. In these two areas the Vb forests comprise 92 percent of the total of Class V. It is estimated that in the five *fylker* the Vb forests represent more than 40 percent of the total forest area.

The data show the major problems in the technical regulation of the cut to which reference has been made earlier: the very high proportion of irregular stands and a corresponding deficiency in the younger cutting (or age) classes. The high percentage of Class Vb also indicates a major weakness in the present classification system.

The system has been criticized at times because of the substantial element of personal judgement which is involved in classi-

fication. Proposals have been made for the establishment of more objective standards. However, it must be recognized that in dealing with a biological entity such as a forest any system of classification will involve a fairly high proportion of border-line cases. The decision as to whether a particular area is Class III or Class IV is not a critical one for most management purposes. This problem is more serious in the case of Class Vb. Classification of land as Vb indicates a condition unsatisfactory for permanent forest management. Thus, differences in classification here result in differences in the definition of the major elements of the management problem.

The major problem in connection with Class Vb, however, is the wide range of conditions which is included under it. This is indicated by a special study made in Vestfold in connection with the national forest survey (Vigerust, 1949). The variation in stand conditions in Class Vb is shown by the following summary of results on special sample plots:

Stand density in percent	*Percent of area*	*Age in years*	*Percent of area*
Under 20	18	1- 20	5
20- 40	34	20- 40	13
40- 60	34	40- 80	48
60- 80	11	80-120	30
80-100	2	120-160	4
Over 100	1	Over 160	—

From the very great extent of Vb forests it is obvious that not all of this condition class can be cut and regenerated in a short period. The problem for management, then, must be to determine priorities for the cutting of the Vb areas. The stands included in this class differ greatly in their present commercial value for cutting, in their possibilities for future growth and financial returns, and in the costs which would be associated with their conversion. The financial maturity of various types of stands found in this condition class has been the subject of economic analysis (Jørgensen and Seip, 1954).

The whole system of cutting classes is based entirely on physical productivity criteria. Essentially, Class Vb includes those stands which will fail to produce a particular proportion of the site capacity at stand maturity as defined by physical standards. Any such physical standard can result in difficulties when used as the sole basis for economic decisions such as must be involved in a working plan for private forest property. Certain of the stands represent conditions in which a high volume growth is being produced on a relatively small capital. Financially, such stands may be satisfactory or even superior from the owner's standpoint. Physical standards of classification can be quite satisfactory for economic purposes provided that they are entirely objective and clearly defined. However, to introduce a classification (for stands that should be cut) which is economic in its direct implications, into a system otherwise physical in its criteria, involves a confusion in thinking which weakens the basis for planning. The solution appears to be to develop clear physical standards for the stands now lumped under Vb. Only such physical data combined with an analysis of the owner's financial situation can provide the correct basis for deciding whether or not the stand should be cut. This is an economic decision—not a matter of field classification.

Working plans for small woodlands. There is, of course, no single method of planning the management of small woodlands in Norway nor of preparing working plans for such areas. Individual foresters and agencies have developed their own special techniques, while differences in properties also require variations in method. However, the prevailing practice in this field appears to be well expressed by the work of The Norwegian Forest Society in preparing working plans for farm forests (Kierulf, 1946; Ludvigsen, 1948).

The society began this work in 1942. This beginning was preceded by five years of study of the problem by various committees composed of leading authorities in Norwegian forestry. Studies of a special

working plans committee led to the development of a model for a simple plan, which was approved by the society's board of directors and which has served as the basis for all of the later work. The program was developed slowly, with 25 plans being prepared in 1942. During 1954, some 508 such plans were prepared, covering 102,000 acres. The total covered from 1942 through 1954 was 429,000 acres involving 2,184 separate plans.

The program is limited to forests of from 50 to 370 acres. The average for the work to date is 196 acres. This program represents the major effort which has been made in Norway in the preparation of working plans for typical small woodlands.

The working plan is presented on a printed form (Det Norske Skokselskap, n.d.) which begins with a general description of the property. This is followed by a summary of data describing the productive forest, showing areas by site classes and cutting classes, the estimated volume, and the estimated growth. In parallel columns there are shown the normal (or desirable) distribution of area by cutting classes for the property and the volume and growth which would be found on such a normal forest.

Next is a section entitled: "Present condition of the forest. Future goals and recommended procedures for reaching goals." Here the forester preparing the plan writes out a description of the management problem and the general approach for meeting it.

The following section presents the recommendations for cutting during the next ten years. This gives a range within which the average annual cut should be kept. This is then broken down into harvest or regeneration cuttings and thinnings or improvement cuttings. Recommendations for cultural work such as drainage, planting or seeding, and cleaning are also listed. These various recommendations are also listed by the individual compartments into which the property can be divided.

The final section consists of forms for the owner's use in maintaining records of cuttings, cultural work, and income and expenditures. There is also provision for a bookkeeping record of changes in the status of the forest each year due to cutting and growth.

In practice, the plans are prepared by experienced professional foresters. Field work is concentrated in the summer period with the reports being completed later in the office. The forester has considerable discretion in taking the inventory basic to the plan. Circular plots are commonly used, but strip surveys may also be used. Occasionally volume and growth are estimated directly. The sampling percentage for determining areas is usually between 4 and 10 percent, with the sampling for volume and growth being lower, usually 2 to 5 percent. It is recognized that on these small properties the sampling error is very large, but it is felt that this is a necessary compromise between costs and the purpose of the inventory.

The heart of the problem of preparing the plan lies in the development of the cutting recommendations. It is here that the forester's skill and judgment are the most important and that the actual procedures followed are the most difficult to determine and describe.

The comparison of actual with normal conditions made in presenting the inventory results is very important. This comparison serves to demonstrate forcefully to the owner the advantages of developing a managed forest. In addition, however, it also provides the forester with a clear model of the type of forest to which his recommendations should eventually lead. Clearly and explicitly the ultimate objective is a regulated even-aged forest. This is also indicated by the printed statement in the section on recommended cutting that diameter-limit cutting or the selection of the best trees must be avoided.

Although the ultimate objective is clear, the problem remains as to how rapidly the

management should move toward this objective. Here consideration must be given to the owner's need for income from the forest and to his ability to invest in the forest. Here, too, comes the main controversy and problem in the handling of the Vb stands—the conflict between the silvicultural view that such stands should be cut and regenerated at once and the economic view that they must be handled for their greatest value in meeting the owner's financial problems.

The actual basis for the recommendation as to the allowable cut for the next ten years appears to be a very approximate method of area regulation modified by the forester's common sense and judgment. Two extremes are recognized: (1) all of the Va and Vb stands might be cut during the period; or (2) cutting might progress at about 1 percent of the total forest area annually. The actual recommendation is set some place in the central part of this range.

If continuous income over the next few decades is important for the owner—the usual case for the farm forest in which the woodland provides an important part of the farmer's employment and income — the rate of conversion to a managed condition will be set somewhat lower than for the owner to whom continuity of income is not so essential. In this judgment process some recognition may also be given to the relationship of the estimated growth and the recommended cut. In practice, the recommended cut seems usually to be set slightly lower than the estimated current growth.

As was indicated earlier, the recommendations as to the cut are always given in terms of an upper and a lower limit. The range between these limits varies from about 16 percent to as much as 30 percent of their average value. In part this is a recognition of the approximate nature of the inventory data and calculations on which the plan is based. However, it is also an explicit recognition of the fact that the working plan can serve only as a guide to the owner. Its purpose is to lead the owner in the direction of better forest management, not to control him. Flexibility must be built into the plan so that the owner has room for adjustments in his operations while still remaining under the guidance of the working plan.

This flexibility is apparent in all stages of the working plan program. Fundamental to it is the use of cutting classes rather than age classes in the development of even-aged management. It is also evident that greater emphasis is placed on bringing all stands into a productive condition than on obtaining a fully regulated distribution of stands. In resolving the conflicts between objectives which necessarily arise in the bringing of unmanaged forests into a regulated condition, the first priority appears to be given to developing silviculturally productive stands, the second to maintaining a continuous and uniform income from the forests, and the third to developing a regulated distribution of age classes.

Variations in this approach to the preparation of working plans for small woodlands are primarily in the details of procedures rather than in basic philosophy. Probably the outstanding example of an alternate approach is the work now being done in part of southern Norway by the *Lågendalen Skogeierforening*, one of the district sales associations affiliated with The Norwegian Forest Owner's Association.

This organization bases its inventory of the property on a highly detailed stand structure map prepared from aerial photographs. The work is done in the field, using contact prints under stereoscopic study but plotting the type lines on enlargements with a scale of about 1/2,800—a procedure considered necessary due to the small size of the individual units that are recognized. Each of these stand units is given a number and the full stand description is entered on edge-sort cards, with one card for each unit. In the field work basic to the stand description, use is made of the relascope for determining basal area per unit of area. The problem of the great

variation in conditions included under Cutting Class Vb has been met by using a system of eleven cutting classes, consisting of the five usual classes plus five "b" classes indicating unsatisfactory stocking in each of the basic classes. The eleventh class is Class VI, which indicates unsatisfactory conditions due to species composition.

An important part of the field work is the collection of information concerning the owner. This includes data on the owner's requirements and supply of labor, the credits which he has accumulated for carrying out work in his forest, his taxes, his cut over the last ten years, his equipment and physical developments for forestry, and his willingness to invest additional amounts. This "owner analysis" has not been used by other groups working with similar plans.

Although this field work gives more detailed stand information and a much more complete basis for economic analysis of the management possibilities, the basic philosophy in developing the management recommendations corresponds to that of The Norwegian Forest Society. Again the ultimate objective is the development of a regulated, even-aged forest, but the immediate recommendations are designed to set up guide posts for leading the owner in this direction rather than to be taken as exact rules which must be followed rigidly.

Operational Aspects of Small Woodland Management

The preceding sections have developed the silvicultural basis considered desirable for small woodland management in Norway and the approach being developed through the use of written working plans to organize the property for silvicultural management. There remain the questions of the operating procedures now characteristic of these woodlands and of the operating problems which appear to be involved in moving toward the recommended form of management. These questions will be considered next.

The current status of small woodland management. There have been no studies in Norway designed to show the proportions of the total forest which are handled under particular management systems or which might be classified as showing "good," "fair," or "poor" management. However, it appears to be the general opinion of Norwegian foresters that the present level of small woodland management is definitely unsatisfactory. Only a small part of the total small woodland area is receiving intensive management under organized working plans and the old system of dimension cutting appears still to be prevalent on much of the area.

In appraising the general level of small woodland management as unsatisfactory, it is essential to point out that the usual type of operation does not destroy the forest or its values. Under Norwegian conditions, diameter-limit cutting or "economic selection" results in a maintenance of forest cover and an opportunity for future cutting. With the solid tradition of the family farm and the stability of ownership found in Norway, it is commonly the case that the present owner of a small woodlot has seen cuttings made from this forest throughout his lifetime and has seen the development of additional growth on the smaller trees following logging. In making his current cuttings he may recognize these growth effects as well as the immediate returns from the higher value trees which he removes. In some cases he may even be attempting to follow a crude sort of common-sense "selection" system of management. Utilization practices are intensive. Logging is primarily a hand operation using horses rather than machinery for additional power. Thus there is usually little damage to the residual stand.

However, Norwegian foresters are convinced that over longer periods such operations result in stand deterioration and low yields. The superficial appearance of productivity of the irregular and understocked stands which are developed is considered a "green lie." Thus the unsatisfactory na-

ture of current small woodland management is not a destruction of forest values, but instead it is a failure to realize the true growth and value potential of the land.

It is also important to note that properties managed under the recommended cutting practices can be found in practically all areas. Sufficient progress has been made so that there is a sound nucleus for demonstrating the effectiveness of the recommended measures. If experience bears out expectations, these properties should serve as focal points for the spread of the recommended measures to additional areas. Considering the slowness of response to management of the northern forests, the major reorientation in practices required to achieve the desired form of management, and the comparatively recent development of the concepts involved, it seems fair to say that Norway has made substantial progress in changing the management of its small woodlands.

The operating problems of the recommended management practices. To develop a property into a fully regulated, even-aged condition is necessarily an undertaking which extends over many decades. Obviously the experience with this form of small woodland management in Norway has not been sufficient to demonstrate fully the operating practicability of the recommended methods.

Probably the primary question concerning the application of even-aged management to small properties is the compatibility of this method with an objective of regularity of income for the owner. When the size of the individual clearcut unit becomes a substantial proportion of the entire holding, the income from the property becomes either highly irregular or periodic. Thus, if annual income is a controlling objective, the minimum size of property to which even-aged management is suitable for any particular rotation becomes a function of the minimum size of clearcut unit which is silviculturally and economically sound. While thinnings provide some flexibility in this, it is nonetheless true that the clearcuttings must be made at short intervals if regularity of annual income is to be achieved.

Thus the question of the minimum size of the individual clearcut units becomes of considerable importance. As envisaged in Norwegian silvicultural thought, such clearcuttings may at times be less than an acre in size, although a minimum of from 1 to 2 acres is probably more typical. As the individual unit becomes smaller, the ratio of perimeter to area rises rapidly. A pronounced "edge" effect frequently occurs, with good regeneration being obtained in the central portion of the unit but only sparse and poorly developed regeneration immediately adjacent to the older stands. This problem can be met to some extent by the use of an "advancing edge" technique under which the successive clearcuttings are laid out so as to widen and advance an initial cutting center. However, the possibilities of such a plan are limited by the natural composition of the forest and other considerations. Thus there remains a serious question as to whether or not management based on very small regeneration units will result in the desired standards of uniformity and stocking of the new stands.

Assuming a rotation of 100 years, it is theoretically possible that a managed forest of an even-aged character yielding annual income could be developed on an area of less than 100 acres, but a minimum size range of 100 to 150 acres appears more realistic. In this connection it is worth noting again that the minimum size woodland for which The Norwegian Forest Society prepares working plans is 50 acres, and that the average size of the units for which plans actually have been prepared is 196 acres—nearly three times the average size of farm woodlands (67.5 acres) in Norway reported in the 1949 census.

In the case of the smaller properties it is argued that the objective of regular annual income must be abandoned in order to increase the total yield and value recovery. It is variously contended that these

very small holdings do not represent a sufficiently important part of the economic base of their owners to justify attaching major importance to annual income and that they are of such a size that no practicable system of management could yield continuous annual income. For present purposes, however, the intent of this analysis is simply to bring out the fact that the approach to the technical management of small woodlands being developed in Norway appears most promising for properties somewhat larger than those typical of the farm woodlot of many regions in the United States.

There is also some question concerning the long-term costs associated with these small unit operations. Forestry and logging operations in Norway are based primarily on human labor and the use of horses. Although increasing use is being made of small tractors and other equipment in the woods, the mechanized operation is still the exception rather than the rule. So long as these conditions prevail, there is probably no particular economic disadvantage associated with the small size of units. However, Norway is becoming increasingly urbanized and the level of industrial wages is rising above earnings in the forest. If forest workers are to share in a rising standard of living, it apparently will be necessary to increase their productivity through increasing the ratio of capital (i.e., mechanical equipment) to labor in forest operations. General experience with the mechanization of operations indicates that such a change tends to lead to an increase in the minimum size of units for economic operation.

In this respect current trends on the large ownerships in Norway appear significant. Although the clearcut units commonly used on these large holdings have been substantially larger than those discussed above, an effort is currently being made on a number of these properties to aggregate the stands into larger units for purposes of logging, regeneration, and other treatments in order to increase operating efficiency.

Actually, the question raised here goes well beyond the costs associated with a particular form of organization of small woodland management. The basic issue is the long-term economic efficiency of small holdings versus large holdings in forest management. To date the Norwegian experience provides little evidence concerning this. In fact, the question itself does not appear to have been widely recognized.

Public Regulation of Private Forest Management

The preceding stage of this analysis has dealt with the technical problems in developing intensive forest management on small woodlands in Norway. In the following sections the standpoint of the analysis will be shifted from the individual small holding to the general institutional setting which directly affects small woodland management in the nation. It is clear that one of the generally accepted objectives of domestic policy in Norway is the development of improved forest management and increased forest growth. So long as the institution of private ownership of land is maintained, measures leading toward this objective must consist primarily in the development of an institutional environment surrounding the woodland owner which will facilitate or force actions on his part leading toward this goal. The institutions which are involved in Norway have been developed and carried out by public, cooperative, and private agencies. In the aggregate these institutions reflect the public policy covering small woodland management.

It should be stressed again that the principal reliance in Norwegian forest policy is placed on the private ownership of forest lands. However, the rights of the land owner in the management of his land have been limited by law. These legal limits on the owner's rights in forest management form the structure of public regulation of forestry which is one of the major institutional factors affecting woodland management in Norway.

In considering this strong reliance on public regulation, it is important to recognize the general relationships between the government and the private economy in the nation. Norway is, of course, one of the Scandinavian nations whose development of social legislation and economic controls, combined with strong cooperative movements, prior to World War II led to the designation of the resulting system as "the middle way." A substantial system of economic controls was developed under the Liberal Party, the dominant political force for about 30 years following Norwegian independence in 1905. The program has been greatly expanded and increased by the Labour Party which has controlled the government since 1935 except for the period of German occupation and which is dedicated to the development of a planned economy. Although in recent elections the Labour Party has received slightly less than half of the popular vote, its political strength has been greatly enhanced by the fact that the opposition vote is split among five different parties. At present the system of government controls extends throughout the length and breadth of the economy. Even in those instances in which direct controls are not in force, a strong indirect influence is often exerted through the prospect that controls would be applied if the government were not satisfied with developments. In many ways Norway now has the most tightly controlled economy of any of the western European democracies.

Public regulation of private forestry in Norway must be recognized as a part of this system. The major importance attached to such regulation cannot be taken as necessarily indicating the existence of distinctive economic problems in forestry not common to other forms of economic activity. In the Norwegian economic milieu, only the absence of some degree of public regulation would be a clear indication of recognition of distinctive characteristics in a particular area of activity.

The Forest Protection Act of 1932. The basic legislation regulating the management of private forest lands is set forth in the Forest Protection Act of 1932, as amended in 1935, 1936, 1938, 1947, 1950, and 1954. (*Lov om skogvern av 12 februar 1932, endr. 7/6 1935, 19/6 1936, 13/5 1938, 2/5 1947, 15/12 1950, og 17/6 1954*). Detailed analyses of this act have been presented in two English publications (Troup, 1938; Anderson, 1950) and more recently in an American study (Marsh, 1954) which includes a complete translation into English of the basic act. These publications provide a thorough coverage of all aspects of the law. The discussion here can accordingly be limited to those aspects which are of especial importance in controlling the management of small forest properties.

Norwegians consider that the guiding philosophy of the act is "freedom with responsibility" (State Directorate of Forestry, 1954). The emphasis on freedom and democratic process is demonstrated primarily in the actual administration of the act, which involves direct public representation at the local level and which emphasizes education and service rather than the exercise of the police power. This is an important aspect of public regulation of private forestry in Norway, since the legislation itself places the power for a very substantial degree of control in the hands of the government.

Provisions tending to control forest management. Fellings and required cultural practices are covered by Chapter II of the act. This section begins with the provisions that so long as the public authorities find that the forest owner is managing his forests in accordance with the principles of good silviculture, he shall have the right to mark his timber for cutting and to manage his forest himself. However, the balance of the chapter provides a number of specific restrictions on management by the owner.

Restrictions on cutting are based on a distinction between young forest stands and

fully grown forests. Classification in specific cases is the responsibility of the public authorities administering the act. Cutting in young stands is permitted only if it is benefical for the further development of the stand. In addition, specific provision for cutting in young stands is made (a) when the cutting is for household requirements which cannot be met from other forest areas held by the same owner, and (b) when it is in accordance with a management plan or the general principles of good forest management, in which case advance approval by the public authorities must be obtained. Cutting in fully grown forests must not be carried out in such a way that (a) natural regeneration is lost or exposed to danger, or (b) the remaining stand is unnecessarily exposed to damage or destruction. In addition, unless permission is obtained from the public authorities, cutting for sale or industrial use must not be so extensive as to involve the probability of a shortage of timber for household use from the property.

Although the owner is ordinarily free to mark his own timber within the restrictions imposed by the act, he is entitled to demand that the marking be done by the public authorities. Such public marking is specifically defined as lawful for the purposes of the act.

In any cutting operations in coniferous timber for sale or industrial use, the owner is required to report the cutting plans to the public authorities in advance of actual cutting. The report must include information on the location, the type of cutting, and the approximate volume involved. The trees must be marked before the cutting takes place. Since it enables inspection in advance of cutting this provision is very important in the practical administration of the act.

In the event that the public authorities find that cuttings have been made in violation of the act or that plans for cutting will result in such violation, they may issue a prohibition against cutting unless the timber is marked by public forest officials. They may also prohibit further cutting entirely or partially for a designated period.

Public marking of timber may also be ordered as a safeguard against speculative land purchase and cutting operations. When forest land is acquired by a person less closely related to the former owner than a cousin the authorities may prohibit cutting for a period of five years unless the marking is done by a public officer.

If the public authorities find after cutting has taken place that the resulting conditions are not such as to ensure natural regeneration within a reasonable time, they may order the owner to carry out the work considered necessary to ensure regeneration and may establish time limits within which this work must be done. The authorities, however, are instructed to attempt to secure an amicable agreement concerning such work before issuing any such order. Such compulsory cultivation cannot be ordered when marking was done by the authorities or specific permission for the cuttings was given in advance unless it was made a specific provision of such marking or permission.

Compulsory cultivation can also be ordered in the case of forests damaged by fire, storm, or other injurious agencies. However, specific limits are set as to the maximum cost of the work which can be required under these conditions.

If the required work is not carried out within the time allowed, the authorities are authorized to order the work carried out with the costs to be charged against the owner.

The law also provides for the designation of two special classifications of forest land: (a) "exposed forest areas," areas in which careless fellings may involve special problems, and (b) protection or "shelter-belt" forests, which are forests providing protection against snow and land slides, drifting of sand, or similar special circum-

stances. Regulations providing for special controls on cutting and direct supervision by the public authorities are established for lands in these classifications in Chapters III and IV of the act.

Conversion of forest land into other uses is permitted under the act whenever in the opinion of the public authorities such a change should be preferred to maintaining the area in forest. However, specific permission must be obtained from the authorities regarding the conversion of coniferous forests if (a) the area is covered with young trees, or (b) the forest owner is under the obligation to carry out cultivation work on the area to ensure reproduction. When such permission is granted, a definite time period for completion of the conversion is established. When conversion is not completed within this period the authorities can order the necessary measures to reestablish forest cover.

In addition to these various regulatory provisions, the Act of 1932 established a system of forced investment in forestry. The provisions of Chapter VI of the act which established the requirement of cultural deposits (*kulturavgift*) will be discussed in a later section dealing with the financial institutions affecting small woodland management.

The administration of the act. The administrative procedures used in connection with the act of 1932 are not of interest as such in this study. However, the system and philosophy of contact which is involved between public authorities and the private forest owners are an important part of the institutional environment of forestry on small woodlands in Norway. Thus some consideration must be given to these matters.

Chapter I of the act provides for a system of public authorities to carry out the functions of forest inspection and general administration of the act. For this purpose the act established a system of boards at three different levels corresponding to the administrative organization of the nation,[2] namely, the *herred* forestry boards with their forest inspectors, the *fylke* forestry boards with their officials, and at the highest level a national forestry board. This independent system of boards for administering the act is organizationally complex, but by means of it a remarkable blending of private forestry organizations and public agencies is achieved. The relationship among the various groups is indicated schematically in Figure 1.

The National Forestry Board is the highest public authority in the administration of this act. The act itself designates that ministry having jurisdiction over the forests (which, under the existing organization, is the Minstry of Agriculture) as the National Forestry Board. In practice, the Minstry handles this responsibility through delegation to the Forest Directorate.

The law specifically provides for the establishment of at least one forest society in each *fylke*. No mention of the Norwegian Forest Society is made in the act, but in practice these *fylke* forest societies have been affiliated with the national society which was established as a private organization in 1898. Each *fylke* forest society has a board of five directors who must be familiar with the forest conditions of the *fylke*. The National Forestry Board and the *fylke* council each select one director and his deputy, while the other three directors and their deputies are elected at the annual meeting of the society. As passed in 1932 the act provided that these *fylke* forest societies and the forest technicians

[2]For purposes of poltical administration, Norway is divided into 18 *fylker* and the cities of Oslo and Bergen. Each *fylke* in turn is subdivided into *herreder*. Thus, in a sense the *herred* becomes the basic unit of local government. Although *fylke* and *herred* have frequently been translated as "county" and "parish" respectively, they actually are not directly paralleled by any local governmental units in the United States.

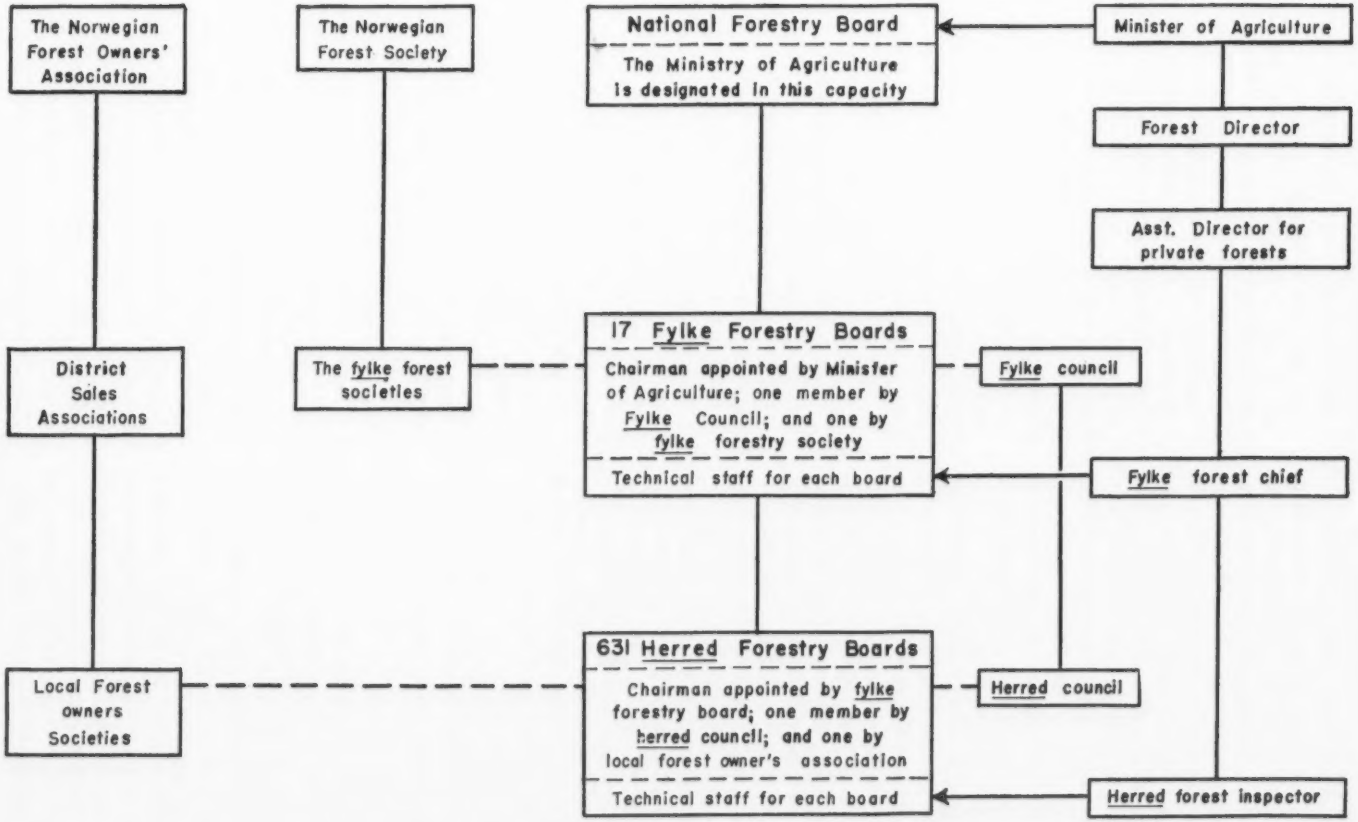
The Norwegian Forest Owners' Association
The Norwegian Forest Society
National Forestry Board
The Ministry of Agriculture is designated in this capacity
Minister of Agriculture
Forest Director
Asst. Director for private forests
17 Fylke Forestry Boards
Chairman appointed by Minister of Agriculture; one member by Fylke Council; and one by fylke forestry society
Technical staff for each board
Fylke council
Fylke forest chief
District Sales Associations
The fylke forest societies
631 Herred Forestry Boards
Chairman appointed by fylke forestry board; one member by herred council; and one by local forest owner's association
Technical staff for each board
Herred council
Herred forest inspector
Local Forest owners Societies

FIGURE 1. *The administrative organization under the Forest Protection Law of 1932 as amended.*

which they appointed (with the approval of the National Forestry Board) should serve as the public authority under the act at the *fylke* level. In this way the administration of the act was closely tied to private forestry interests.

An important amendment in 1947 provided for the establishment of *Fylke* Forestry Boards to carry out the functions of inspection and enforcement under the act. The National Forestry Board appoints the chairman of the *fylke* board, the *fylke* council appoints one member, and the *fylke* forest society appoints one member. The National Forestry Board also appoints the necessary forestry officials, who must be graduates of the higher (university level) forestry school, to assist the board. The national board designates one of these forestry officials as secretary of the board and manager of the *fylke* forestry office. Apparently it was felt that the law was well established and that it would be advantageous to shift the administration from control by a primarily private agency to direct public control. The *fylke* forestry societies were thus relegated to a minor position under the law, but remain as effective educational and extension agencies. The national government is entitled to obtain a refund of one-half of the cost of this organization from the *fylke*.

Direct contact with the individual properties is handled through the *herred* forest boards and their forest inspectors who are appointed by the National Forestry Board. Inspectors must have at least the lower (practical) forestry education. At this level also the organization was designed to enlist the support of private agencies in the administration of the act. Here use is made of the local forest owner's societies which are organized on a local basis under the district sales associations and the national Forest Owners' Society. The position held by these owners' associations, however, has never been comparable to that formerly held by the *fylke* forest societies. The chairman of the *herred* board and his deputy are chosen by the *fylke* forestry board, while the *herred* council and the local forest owners' association each select one member and his deputy. At least one member and his deputy must own forests in the *herred*. It is also of interest to note that any citizen under 60 years of age is obliged to accept election as a member of the forestry board in his *herred* unless he has just completed a 3-year term. At this level also the national government is entitled to recover one-half the costs of the organization from the *herred*.

Administratively, the *herred* forest inspectors carry out the actual inspections, mark timber for cutting, and perform the other functions requiring direct contact with the owners. The *herred* boards report to the *fylke* boards and assist them in carrying out their functions. The National Board issues regulations necessary for the administration of the provisions of the act. A decision by a subordinate board can be appealed by the owner affected to a superior board. In addition, the legality of a decision can be tested by filing at the *herred* court within one month of the date of notification of the decision.

It is apparent from the provisions reviewed above that the law of 1932 gives the public authorities substantial powers to regulate the management practices on private forest land and provides for a detailed organization with police power to enforce these regulatory provisions. However, many of the details of the act and the record of experience under it show that the basic philosophy has been to emphasize the educational-service approach, reserving direct action under the police power for a relatively few extreme cases. In fact, this emphasis on education and service in the actual administration has been such that some Norwegian foresters feel that a simple listing of the major regulatory provisions of the act such as was made above involves the danger of giving a false impression as to the amount of direct regulation actually involved. Be this as it may, the belief is evident with respect to this law (as in many other areas of Norwegian

economic controls) that such educational-service programs are much more effective when it is known that ultimate controls rest with the government, even though in some cases these controls may not often be exercised directly.

The system of *herred* forestry boards and *fylke* forest societies appears to have been an effective device for developing an informed and responsible body of opinion favorable to forestry at the local level. This method of developing popular support is complemented by the activities of the *herred* forest inspectors and *fylke* forest officers who provide the technical knowledge and assistance necessary to convert this generalized support of good forest management into action programs on the forest properties.

Under the provisions of the act the administering officials have a very large amount of discretionary power. Such matters as the classification of forest land, the determination of conditions requiring special regeneration measures, and the determination of types of cutting which involve undue exposure to the remaining stand are not defined by law but are left to the decisions of the administrative officials. Such discretionary power makes it especially important that general public support of the program be achieved through representation on the administering boards.

In addition, it appears that this extensive discretionary power has led to reliance on education and service rather than on direct enforcement under the police power. There is some evidence that the officials, in their efforts not to be arbitrary in the exercise of the authority, have generally been somewhat loose in their interpretations of satisfactory levels of compliance with the act.

The Forest Commission of 1951. As has been discussed, the basic approach to public regulation of the management of small forest properties continues to be that established in 1932 by the Forest Protection Act. The various amendments have tended to strengthen the regulations and to make the exercise of public authority more direct. In this connection it is of interest to note that there is a strong possibility that such public regulation will be considerably intensified in the near future. This is indicated by the work of the Forest Commission of 1951.

Since World War II, there has been an intensified sense of the importance of increasing the growth of the forests in Norway in order to provide a base for expansion in the forest industries. This led to the establishment of the Forest Commission of 1951 by the resolution of 19 January 1951 (Andersen, 1953). The commission is charged with the review of all aspects of forest policy in Norway—afforestation and reforestation, regulation of private management, timber sale procedures, forest labor, education, research, and so on—and the submission of reports and recommendations to the Storting (the national parliament of Norway). Although the work of the commission is well advanced in most of these fields, at the time of writing only one report (Skogkommisjonen av 1951, 1953) has been published. This report called for a large-scale planting program in western Norway, the necessary implementing legislation for which was passed by the Storting in the fall of 1954.

Until reports on the other areas of policy have been published it will not be possible to say exactly what the proposals will be in these fields. It is believed, however, that some of these additional proposals will be more controversial than the planting program for western Norway and there is no basis for predicting the actions that the Storting may take. However, the general philosophy of the commission's approach to regulation of management on private lands is fairly clear.

Bureau Chief Sønnik Andersen, chairman of the commission, stated in an interview with the writer that the proposal of the commission would call for the replacement of the "forest protection" act by a "forest production" act. In other words, the act of 1932 provides essentially for the

protection and maintenance of the existing forests and forest growth, but more positive measures to increase forest growth will be required if the nation is to expand its forest industries. Although these measures will include many things besides regulation of private management, an intensification of such regulation appears to play a major role in current thinking in this field.

The exact means of intensifying regulation of private management have not yet been publicly announced. However, one approach appears to be through the establishment of legal definitions of the various conditions calling for public action rather than the present primary reliance on the decision of the various forest officers. In this way standards of satisfactory performance could be raised and a general tightening of administration might be expected.

Another approach receiving very serious consideration is the requirement of a written management plan for each forest property. Such plans would be extremely simple for the smallest properties and somewhat more detailed for larger properties. The plans would be prepared by private agencies, perhaps by foresters employed by the District Sales Associations, but would then be filed with either the *herred* forestry boards or the *fylke* forestry boards. Any changes from the plans would require written notice in advance.

Whatever the details of any legislation that may be passed, it is apparent that there is a trend toward intensified regulation of private forest management as an important means for improving the management of small woodlands in Norway.

Timber Marketing

The problem of markets is a critical one for every productive enterprise. To a minor degree the small woodland owner, and especially the farm woodland owner, can provide his own markets through his personal use of posts, poles, fuelwood, and so on. Adequate markets and adequate marketing institutions, however, are essential if there is to be an economic incentive to the practice of forestry. It is through the sale of standing trees or logs that the owner receives his main return from his forests.

The adequacy of markets is controlled by the level of activity in the forest industries relative to the available forest resource. It depends upon the existence of economically sound and progressive forest industries. Assuming adequate marketing institutions, the adequacy of markets does not appear to involve any special problems related to size of holdings. However, the small woodland owner does have special problems due to size in reaching the existing markets. Basically, he tends to suffer from a lack of knowledge of markets and prices and from a weak bargaining position. These conditions arise from the characteristically small and frequently intermittent supply which he has to offer for sale.

In Norway, the question of the adequacy of markets for spruce and pine is not considered critical. As has been discussed earlier, the level of production in the existing forest industries is limited by the availability of timber. The problem is to increase timber supplies to enable an industrial expansion rather than to find industries to use existing supplies. There are, of course, some exceptions to this. For example, in many areas there is no pulpwood market for early pine thinnings, and such small materials must be sold on the highly variable pit-prop market. Generally, however, markets exist for the materials which can be cut from the forest.

With the bulk of its timber coming from small properties, Norway has, through both public and cooperative action, developed marketing institutions to meet the problems. These institutions appear adequate for the small owner, but they involve problems of their own.

The marketing institutions discussed here must be considered in terms of the special conditions of log transportation and market geography found in Norway. In the generally rocky and hilly or mountain-

ous forest areas, the well-developed river systems provide the principal medium for log transportation. Small local wood industries use only a part of the total volume of logs; the greater part produced in each river district must be sold to a few large-scale buyers located down stream. As a result it is probable that there never has been even an approximation of a fully competitive log market in Norway.

The system of measurements and prices. The principal legal basis for the system of log measurements and price tables used in Norway is the Timber Measurement Act of 1928 *(Lov om tømmermåling m. v. av 22 juni 1928, endring av 21 juni 1946 og 18 juni 1948)*. This law authorized the King to establish tables of volumes, price relationships, and class divisions for logs. In addition, it provided for the establishment of log-scaling associations.

The log-scaling associations are joint organizations of buyers and sellers, operating under a board of directors representing both groups. In all, fourteen scaling districts have been established with boundaries corresponding to the watersheds of the main floating rivers (Statistisk Sentralbyrå, 1954). This system assures the small woodland owner of a skilled and impartial application of the scaling regulations in the determination of the volumes of the logs which he sells.

The methods of log measurement and pricing which are applied under the law have been developed from established trade practices. In its major elements, the system is developed around the use of two different bases for measuring logs, middle-measurement and top-measurement. Under middle-measurement the middle diameter and the length of the log are measured and the volume in cubic meters is taken as equivalent to that of a cylinder of the same dimensions. Prices for middle-measured logs are determined by setting a base price per cubic meter. Under top-measurement the top diameter and the length of the log are measured. Prices for these logs are quoted on a piece basis. By national regulation a price table for top-measured logs has been established which fixes the price relationships among such logs of various diameters and lengths. Actual prices for top-measured logs are set by agreement as to the percentage increase to be applied to this price table.

In any sale the seller has the choice for each log as to whether it will be sold by middle-measurement or by top-measurement. Obviously it is to his advantage to sell those logs under top-measurement which will bring a higher price in this way than under middle-measurement. Thus the system ensures premium prices for those logs which are superior in size or quality. The price table for top-measured logs itself reflects the greater values associated with larger sizes. In addition, the distinction between top-measurement and middle-measurement provides a premium for differences in log quality associated with taper, since, with other factors being equal, top-measurement tends to favor logs of low taper.

This system has the advantage of limiting the issues involved in the yearly price negotiations—an advantage especially important under the conditions of log price negotiations in Norway. From the standpoint of the small woodland owner, however, the feature of particular importance in the system is that it ensures a premium price for logs of the larger sizes and better quality.

The cooperative timber sales associations. In the past many small forest owners in Norway felt themselves to be at a disadvantage in the selling of their logs. They had to deal with buyers who represented larger economic units and who were believed to have "gentlemen's agreements" among themselves about the price they would pay for timber. The buyers frequently used contracts calling for delivery of specified quantities of logs at a price to be determined later. Under these conditions the sellers felt a need to strengthen their bargaining position.

As early as 1900 the sellers began to organize local societies. In 1913 the Norwegian Forest Owners' Association *(Norges Skogeierforbund)* was established as a national organization. It is of interest to note that this organization was established completely without public subsidy. In fact, the original directors had to pledge their personal resources as security for the organization. Not until 1929 did the association become fully effective, at which time it was reorganized, with provision for district sales associations to carry out the marketing activity for the members. The primary function of the association continues to be to represent the interests of the forest owners in timber sales.

The individual forest owners are the foundation of the entire organization. In 1954 the association represented 40,458 owners who held 7.2 million acres of productive coniferous forest (Norges Skogeierforbund, 1954) or 56 percent of the total area of such forests in Norway. Complete data are not available on the ownership of productive coniferous forest land, but it is estimated that the association members own about two-thirds of all such privately owned lands. A considerable part of the remaining one-third of private coniferous forests belongs to the larger private owners who generally do not belong to the association, since they ordinarily process their own logs. Thus the Forest Owners' Association has achieved a very high degree of control of the supply of market logs from private forest land.

These owners are organized in 438 local forest owners' societies at the community level. The local societies are in turn organized into 22 district sales associations along the major floating rivers. The number of local societies combined in a single district association is variable, with a high of 39. Finally, the district sales associations are organized in the Norwegian Forest Owners' Association. This general structure is indicated by Figure 2. The national association is affiliated with the Federation of Agricultural Cooperative Associations *(Landbrukets Sentralforbund)* which was initially organized in 1945 (Grimley, 1950).

The Board of Directors of the national association consists of ten members elected by the annual assembly of representatives of the district sales associations, one member representing the Norwegian Farmers' Union *(Norges Bondelag)*, and the managing director of the association. The directors of the district associations are elect-

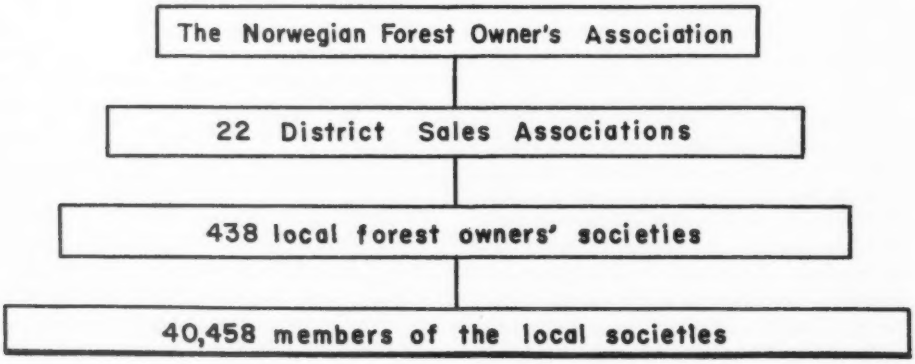
The Norwegian Forest Owner's Association
22 District Sales Associations
438 local forest owners' societies
40,458 members of the local societies

FIGURE 2. *The structure of the Norwegian Forest Owners' Association.*

ed by assemblies of the representatives of the local societies, and the local societies in turn are controlled by assemblies of the individual forest owners.

Financially, the district sales associations are the primary units. The forest owners pay the sales associations 0.5 percent of the price received for their logs, while the buyers make a payment to the association in addition to the price paid for the logs. The amount of this additional payment varies among the districts, but averages about 1.0 percent of the price. This gives the district associations approximately 1.5 percent of the value of log sales to meet operating expenses. In 1953-54 the total sales of all the district associations amounted to 348,257,142 kroner ($48,756,000). The districts sales associations provide the financial support for the national association.

The district associations are also the primary operational units, with the work being carried out by a salaried manager and his assistants. The individual owners report to their local societies the amounts of timber which they have to sell. Actual delivery must be within ± 10 percent of this reported amount. The local societies, in turn, report the quantities to the district associations. The district associations negotiate the actual sales arrangements with the wood using industries and supervise the administration of the sales.

The district association assumes title to the logs during the transaction, but its position as a sales intermediary is carefully protected. The contracts with the owners call for delivery of the logs to the same points as those specified in the contracts with the buyers for acceptance of the logs by the mills. A single determination of log volumes is used in both purchase and sales contracts. Provision is made for prorating back to the sellers the effects of any decline in price or inability to sell the total volume of logs.

Several sawmills and one wood preservation plant are owned or controlled by the sales associations. Although neither the district associations nor the national association consider wood processing as their primary function, it is believed that representation in the wood manufacturing industries is desirable, since this provides access to cost and marketing experience at the product level and thus improves the bargaining position for log sales. The management of the national association would like to have the forest owners develop a pulp mill for this purpose also, but due to the high cost involved this is not considered likely in the near future.

In the past price negotiations were handled on a regional basis by the individual district associations. However, this function has been increasingly centralized and is now primarily a function of the national association. The national association also represents the interests of the forest owners to the public authorities, carries on general programs of information and education, publishes a magazine for forest owners, and conducts similar activities.

The effectiveness of the district sales associations was tested by their establishment and survival in a period of badly depressed log markets. Their greatest success, however, has come with operation in a prolonged period of rising timber prices. The extent to which they could maintain their present strong position in a period of falling prices has not been tested. Nonetheless, both the high degree of acceptance of the associations by the forest owners and the evidences of strength shown in their price negotiations indicate that the cooperative approach has been a very effective device for solving the marketing problems of small woodland owners in Norway.

The success of timber marketing cooperaties in Norway is of especial interest when viewed in terms of the situation in the United States. The cooperative approach to timber marketing has often been advocated and more than 30 such marketing cooperatives have been established in the United States (Cunningham, 1947), frequently with a substantial amount of public assistance and direct subsidy. However,

the success of such efforts has been very limited and except in isolated instances cooperatives play no role in the marketing of timber from small woodlands.

An understanding of the form of the marketing problem faced by the small owner helps to explain this difference in the effectiveness of cooperatives in the two countries. In Norway there have been active and established markets for most of the products which could be cut from the forest. There the function of the cooperatives has been to provide the small owners with bargaining strength in reaching these markets. In the United States, in contrast, most efforts at establishing cooperatives have been in regions in which markets did not exist for the generally small and often low-grade materials which could be supplied from the forest. The use of a cooperative as a means of developing markets which other forms of economic organization cannot provide is quite a different problem than bargaining in established markets.

Price determination. The usual method of selling timber in Norway is in the form of logs delivered at the main floating rivers, at truck roads, or at railroad stations. The principal issue in price determination is the price level for such delivered logs. This price level is set by the base price per cubic meter for middle-measured logs and the percentage increase to be applied to the price table for top-measured logs. Ordinarily the price level is set in the fall during the early part of the logging season. Although in some instances adjustments have been made in response to unforeseen developments the price level is usually held constant for the entire logging season.

The negotiation of the log price level is carried out on a highly centralized basis. In the principal negotiations the interests of the sellers are represented by The Norwegian Forest Owners' Association and the interests of the buyers by the Norwegian Timber Trade Federation *(Norges Trelastforbund)*, the Norwegian Pulp and Paper Manufacturers' Council *(Norges Treforedlingsråd)*, and the Norwegian Fibre Board Manufacturers' Association *(Norske Wallboardfabrikkers Forening)*. Thus even in the absence of government price controls the individual sellers and buyers of logs have very little freedom for independent action in price determination. In addition, however, the government also plays a very important role in the price negotiations, sometimes directly and sometimes indirectly.

Public action in controlling prices in general is well established in the Norwegian economy (Semmingsen, 1954). The first price control regulations were established during World War I, but remained in force into the 1920's. A new law passed in 1926 gave the authorities the power to intervene in any cases of exorbitant prices or similar problems. With the outbreak of World War II an extensive system of price controls was introduced. This system was continued through 1953 on the basis of temporary legislation. The Price Control Act of 1953 which became effective on January 1, 1954, established a permanent price control policy. Under this act the decision as to the extent to which price controls shall be enforced at any time rests largely with the government in power. Although direct price controls are currently applied only on selected commodities, this network of direct controls combined with the power to apply additional controls enables the government to exert a very substantial influence on all prices.

In effect, the negotiation of log prices has become a three-cornered affair between sellers, buyers, and the government, which sits in as a far-from-disinterested umpire. The working of the system can be indicated best by a brief review of the 1954-55 price negotiations, which were especially prolonged and difficult.

In order to facilitate its domestic policies, the government has continued to impose price controls on construction lumber and paper sold in the domestic markets. These domestic prices are set well below the

world market prices. However, producers recognize that they are not free to sell entirely in the world markets and by internal arrangements in their associations ensure that "adequate" supplies reach the domestic markets in order to forestall direct governmental allocation.

With prices for the main forest products controlled in the domestic market there was little possibility of freedom of action in the price negotiations for logs. The buyers felt squeezed by the price controls, while the sellers pressed for higher prices to provide for needed capital investments in their forests. The situation was complicated by the fact that price controls rest more heavily on lumber manufacturers than on pulp and paper manufacturers. This stems from the fact that the domestic market takes almost all of the lumber but only a limited part of the pulp and paper production. Thus it was felt that the pulp and paper mills could pay a higher price for logs than the lumber mills. However, it was also held that a single price system must apply to all logs in order to obtain the desired distribution of logs to the various industries.

Under these conditions the sellers and buyers were unable to come to an agreement on price. As a result the government exercised its price control powers and on December 3, 1954, established a base price for middle-measured spruce of 70 kroner per cubic meter ($0.28 per cubic foot). In addition, pulpwood buyers were required to pay 11 kroner per cubic meter ($0.044 per cubic foot) into a special fund which would be distributed to the investment accounts[3] of all log sellers. In this way the price to the seller was not affected by the industry purchasing his logs, while the cost to the pulp industry was substantially higher than the cost to the lumber industry. The amount of credit to the investment funds was variously calculated at from 4 to 6 kroner per cubic meter ($0.016 to $0.024 per cubic foot) for all spruce logs. Similar provisions were made for other types of logs.

The Forest Owners' Association was not satisfied with these arrangements and let it be known that only 70 percent of the previous year's volume would be delivered at these prices. At a meeting with the representatives of the buyers on December 15 the association secured agreement to a proposal for a 9.50 kroner per cubic meter ($0.038 per cubic foot) payment to the investment deposit to be credited for all logs (Anon., 1955b).

Under these pressures the government revised its price control order in January after considerable debate in the Storting. The modified regulations provided for a guaranteed investment credit of 9 kroner per cubic meter ($0.036 per cubic foot) for all coniferous logs. The pulp industry was required to make a special payment of 17 kroner per cubic meter ($0.068 per cubic foot) for all logs purchased after February 4 and of 11 kroner per cubic meter ($0.044 per cubic foot) on all stocks, no matter when they were purchased, and on all contracts made before February 4.

These price negotiations were especially difficult and drawn out. As a direct result of this experience, the various industrial associations and the Forest Owners' Association entered into an agreement designed to prevent such stalemates by providing that negotiations would begin in August, would be submitted to arbitration if no agreement were reached by September 15, and would be taken to a special court if not settled by the end of September (Anon., 1955a).

This experience shows clearly the high degree of bargaining strength developed by the Forest Owners' Association. Certain of the economic consequences of this

[3]These investment accounts are accumulated from special deposits required at the time of log sales. These deposits, credited to the accounts of the individual sellers, are controlled by the public authorities and are used to reimburse the forest owners for various approved capital investments in their forests. This system is discussed further in a later section.

strength are of particular interest. As the cooperative has brought the bulk of market logs under its direct control, it has developed a substantial monopoly power on the part of the sellers. The buyers, who already had some degree of monopoly, have reacted by further uniting of their bargaining strength. Thus price negotiations have become highly centralized and are carried out in effect in a bilateral monopoly situation. Economic theory has no unique solution to price determination under these conditions—a finding which seems related to the difficulty in reaching a price agreement in the Norwegian situation. Generally the implicit threat of direct government intervention appears to have been a significant factor in enabling agreements to be reached in recent years, while the 1954-55 impasse was ended only by direct government action.

In considering these monopolistic elements in log marketing in Norway, it should be emphasized again that the conditions of log supply and transportation work against the development of a fully competitive log market. Small, local buyers take only a limited part of the total cut. Transportation economies force the flow of the main volume of logs down the major floating rivers, resulting in access to only a small number of large-volume buyers. Under this condition of some degree of natural buyers' monopoly, it was perhaps inevitable that effort to equalize bargaining strength should lead to bilateral monopoly.

Under such a basis for price determination, there is always the possibility that the quantity of logs supplied may not balance the quantity of logs demanded. The district associations protect themselves against an "oversupply" of logs by provisions in their contracts with the owners which provide for prorating the effects of any lack of sales. However, in recent years the common problem has been a log supply less than the demand. Under price controls this problem is usually met by systems of priorities and rationing.

In Norway there has not usually been any public allocation of the log supply except during the period of World War II To the extent that the price system fails to determine completely the allocation of logs among buyers, reliance is placed primarily on negotiations at the river district level. The district sales associations work out the distribution of logs among the various buyers by negotiations with the district buyers' associations. While there obviously are difficulties in an allocation of supplies not based directly on price, it has been found possible to reach such agreements by private negotiations under pressure of the knowledge that direct governmental allocation would otherwise result. The negotiations, of course, are greatly influenced by established patterns of allocation and the entire system appears to involve a lack of flexibility in economic adjustments.

That the threat of government allocation is very real is shown by the fact that the government took direct action in this field during 1955. In order to increase the supply of logs to the pulp mills, the government issued a directive in March, 1955, providing that middle-measured logs could not be sold to sawmills without special permission and that middle-measured logs then in the possession of sawmills must be sold to pulp mills.

The system described above does not completely cover the supply of market logs. Forest owners who do not belong to the district sales associations are not bound by the agreements which these associations may reach. In the absence of direct public price controls these independent sellers are free to reach their own price agreements. However, the mills belonging to the buyers' associations ordinarily abide by the prices negotiated with the sales associations when buying logs from the independent sellers.

In addition, a part of the wood supply is purchased as standing trees rather than as delivered logs. Some owners do not wish to get involved in the logging and some buyers believe that there are operat-

ing economies in doing their own logging on a larger scale than is possible for the average forest owner. It is also possible to introduce some degree of price competition in determining the stumpage price, even though stumpage prices are derived from established log prices.

Financing the Forestry Operation

Forest management is basically a program of capital investment. In young forests an improvement of forest growth ordinarily requires an increase in capital investment through an increase in the volume and quality of the growing stock. Sustained forest growth can be obtained only through the maintenance of an investment in growing stock which at least in part could be marketed in the current period. Immediate cash needs exert a strong pressure on the woodland owner to liquidate at least a part of this investment at the cost of long-term forest management.

The problems of capital investment are especially acute in the case of low-income owners of forest land—an ownership type commonly encountered in many regions in which small holdings are important, especially farm woodlands. The low-income owner is at best in a difficult position even to maintain his current investment in growing stock and certainly will not ordinarily look with favor on increasing his investment. And owners at a better income level may also experience immediate needs for cash and may prefer alternate investment opportunities to investment in improved growing stock.

Under these conditions it is apparent that the financial institutions surrounding small woodlands play a very important role in the level of forest management that is actually achieved. In Norway the provisions of the Forest Protection Act of 1932, especially those controlling cutting in young growth, are obviously important in forcing the maintenance of investment in forestry. However, in addition to these restrictive forces there have been developed a number of positive measures for channeling funds into forestry and for assisting the woodland owner in meeting his financial problems. The important financial institutions affecting small woodland management include a program of forced investment, provision for public subsidies, sources of long-term and operating credit for forest operations, and insurance against loss from fire. Both public and private agencies play an important part in this financial program.

Forced investments. One of the most interesting phases of public forest policy in Norway is the provision for holding a portion of the sale value of logs in trust for the owner and releasing it to him as reimbursement for the cost of certain forest management activities. This can be considered as a program of forcing the investment of private capital into specified channels. This approach to forest management appeared first in 1908 when a law was passed authorizing the community boards to establish a cultural deposit on timber cut for sale (Holand, 1951). Such a deposit was to be paid to the *herred* cashier and repaid to the owner on the basis of expenditures to obtain reproduction. However, this law had little practical effect since few of the boards made use of the authorization to impose levies and general conditions in forestry did not favor such a program.

With the passing in 1932 of what is generally considered to be the first really effective forest law, this policy of forced investment was firmly established on a national basis. Chapter VI of the Forest Protection Act of 1932 provides for a system of cultural deposits *(kulturavgift)* to be collected and managed under regulations issued by the National Forestry Board. The law now provides that any person felling timber for sale or industrial production must carry out cultural work to promote forest regeneration and that for this purpose he must pay a deposit of 2 percent of the gross value of the felled timber. In practice, this 2 percent is commonly withheld from the seller and deposited to the

seller's account by the buyer.

As originally passed, the law required a deposit of only 1 percent and the deposit was required only from owners who could not show that they had carried out cultural work in this amount. The amendment of 1938 raised the amount of the deposit to 2 percent and made it compulsory for all forest owners, regardless of the amount of cultural work they had done. This provided more adequate financing for the regeneration work and enabled uniform administration by the forest officers.

Collection of the deposits runs very smoothly in the main forest districts in which most of the wood goes to pulp mills and large sawmills. The logs are delivered to the main rivers, the railroads, or the truck roads and are sold either directly to the industries or through the district sales associations on the basis of official measurement. The buyers withhold 2 percent of the payment to each seller. Sellers are grouped in each *herred* and the deposits are sent to the community savings banks. At the same time a statement of payments is sent to the *herred* forest inspector, who maintains individual accounts for the owners on a card system.

More difficulties are experienced in regions where many of the sales are to small local users or where the owner uses the timber in his own sawmill. In the last case the owner must pay the deposit directly. Under these conditions the collections require a great deal of work and probably are not complete.

The owner is then reimbursed from this account for his costs in approval cultural work related to establishing reproduction, including planting, seeding, burning and other methods of site preparation, and drainage. In submitting his claim the owner lists all payments made in connection with the work and a charge for his own time spent on such work at established wage rates. The work must be inspected by the *herred* forest inspector, who can reduce the charges if the evidence in support of the claim is not adequate.

The *herred* forest officer also assists the small and medium-sized owners with the planning of the work. The work can be done under the direct supervision of this officer, but it is more common and generally considered preferable to have the forest owner administer the work.

If the public authorities find that no cultivation work is necessary for the time being on any ownership, the *fylke* forestry board can suspend the collection of the deposit. The possibility of exemption from payment was further extended by the amendment of 1954 which provided that the public authorities could suspend collection of the deposits in any *fylke* or part thereof. This amendment also provided for the refunding of the deposit if the inspector finds that additional cultural work is not needed.

In addition, the amendment of 1954 clearly established the fact that the owners have no claim for interest on the deposits. Any interest that accrues can be used as the public authorities prescribe for the administration of the fund, the payment of losses, or the general advance of forestry.

The law not only provides for the collection of the deposits but also in effect requires the expenditure of the amounts collected when cultural work is needed. This follows from the provision that if the cultural work is not carried out to the amount of the deposit within a resonable time limit to be prescribed by the public authorities, the authorities can arrange for the work to be done and charged to the account of the owner.

Despite this provision, however, payments from the cultural deposits have consistently been less than collections of the deposits. The balance held in the deposit has risen steadily and rapidly to a total of 36.3 million kroner ($5.08 million) by December 31, 1953 (Statistisk Sentralbyrå, 1955). During the period 1946-53 total collections amounted to 55.6 million kroner ($7.78 million), while repayments amounted to only 27.3 million kroner

($3.82 million) or 49 percent of the credits.

This relatively low level of repayments is usually attributed to a shortage of forest labor (at prevailing wage rates), limitations of planting stock, and similar problems which have existed in the post-war period. Another factor of importance appears to be that not all owners are fully familiar with the provisions of the law covering repayment. Whatever the immediate causes, this experience seems indicative of the difficulties of stimulating investment in small woodland management. After some 22 years of experience under the law, less than half of the funds collected have actually been invested in such cultural work.

At the same time it should be noted that the ratio of repayments to collections has risen steadily during the period of experience under the law, with a particularly rapid rise in the last few years. In 1953 repayments reached a wholly unprecedented 94 percent of the year's credits. Despite the slow development of the action program, there can be no doubt that this type of approach is gradually proving to be highly effective in channeling funds into small woodland management.

Certainly the Norwegians themselves consider this approach to be effective. This is shown by the extension of the method to additional phases of forest management since World War II through the establishment of investment deposits *(investeringsavgift)*. These investment deposits originated in the special conditions which followed World War II (Holand, 1951). Prior to the war, timber prices in Norway tended to move with the world price of forest products. World prices rose rapidly following the war, while the government tried to follow a price stabilization policy which involved holding down timber prices in order to protect the domestic prices for forest products. Forest owners complained strongly that their prices did not reflect the rising prices received for exports, which are especially important in pulp and paper. At the same time there was much concern over the condition of the forests. During the war no investments had been made in the forests and there was felt to be a great need for forest roads, forest houses, mechanical equipment, and similar investments. The proposal for an investment deposit paralleling the cultural deposits was adopted as a means of solving both of these problems.

By resolution of 15 August 1947 the Storting established an "investment fund for forestry" by requiring the payment of 6 kroner per cubic meter ($0.024 per cubic foot) for all pulpwood used for export production in the working period 1947-48. These payments, supplemented to a minor extent by state funds, were used to establish separate accounts for all forest owners cutting timber for sale, both for domestic and export markets, in the amount of 3 kroner per cubic meter ($0.012 per cubic foot) of all timber sold. These accounts were to be used for the improvement of management of the forests by investment in forest roads, stream improvements for floating, certain silvicultural work, and similar matters. Similar provisions, with some variation in amounts, were made for the working period 1948-49.

In 1950 the "investment fund" was disbanded and the system of payment by the industries for wood used for export production was dropped (Statistisk Sentralbyrå, 1954). Since working year 1949-50 the investment deposits have been included in the timber price. Provision is made for the direct payment of this amount in the same manner as the cultural deposits.

Through the working year 1951-52 the investment deposits were provided for annually by various resolutions in the Storting, with the amounts of the deposits varying from year to year and various special provisions being made. A more permanent provision for investment deposits was made with the enactment of the interim law of 19 December 1952, which provided that the King, in order to advance forest production and forest management, can estab-

lish an investment deposit for forest work. The size of the deposit can be set each year. In practice, the organizations representing buyers and sellers of timber have recommended the level of the deposits to the government.

The deposit is required for wood sold and delivered, for wood sold on the stump, and for wood processed for later sale by the owner himself. The amount and imposition of the charges has continued to be varied from year to year. During 1954-55 an extra charge was levied on all purchases of coniferous logs made by the pulp mills. These funds were then used to establish investment deposit credits of 9 kroner per cubic meter ($0.036 per cubic foot) for all coniferous logs sold. This credit amounted to nearly 13 percent of the base price of middle-measured spruce excluding the investment deposit.

Ordinarily these deposits must be used for investment work on the forest from which the timber was cut, although provision is made for granting permission for use of the funds on other forests in the same ownership. If the public authorities find that no investment work of the types covered by the law is needed the deposits are to be returned to the forest owner. As in the case of the cultural deposits, payments have been less than collections and the balance in the deposits has been rising (Statistisk Sentralbyrå, 1955).

During the six working years from 1948-49 through 1953-54 the amounts paid in totalled 196.1 million kroner ($27,460,000), while repayments amounted to 117.9 million kroner ($16,510,000) or 60 percent of the credits. The trend of repayments has been markedly upward in this program also, with repayments in 1953-54 equalling 91 percent of the annual deposits. Both the much larger sums of money involved and the higher ratios of repayments to deposits indicate that this program covers an area of greater interest to Norwegian forest owners than the cultural deposits. During these six years 48 percent of the repayments were for forest roads, 28 percent for cabins for forest workers, and 24 percent for miscellaneous investments and refunds.

Thus these twin programs of cultural deposits and investment deposits have channeled a substantial part of the returns from logs cut for sale or industrial use into investment in regeneration or forest improvements. Although actual investment under these programs has been much less than the amounts deposited, the upward trend in repayments indicates that with continuing experience the program is becoming successful in meeting its objectives.

The basic philosophy underlying this approach appears to be entirely consistent with that of public regulation of private forest management and might in fact be defended as simply a logical extension of the regulatory approach. At the same time these deposits greatly facilitate the programs of education and technical assistance. There can be no doubt that the availability of these deposits has a great influence on the acceptance by the woodland owner of technical advice. The Norwegian woodland owner who has sold logs can commonly carry out recommended practices without any out-of-pocket cost and often with a direct cash return for his own labor. In general this program of forced investments appears to be an important element in Norwegian forest policy.

Subsidies. Like most western nations, Norway provides indirect financial support to forest management on private lands through the employment of public foresters concerned with private lands, the support of research in forestry, the provision of both general and professional education in forestry, and similar measures. In addition, Norway makes uses of direct financial payments in support of certain forest management activities. Such activities include forest cultivation work related to regeneration, drainage, and the construction of roads. Public subsidies for planting were first established in 1863 and for forest drainage in 1897. Since the passage of the

Forest Protection Act of 1932 these programs have been administered by the system of public authorities established under this act in connection with other forest cultivation work.

In most of the forest areas the payment of subsidies in amounts up to one-third of the cost of the regeneration work is authorized. In practice, however, each *fylke* receives a certain sum of money which must be distributed among all those qualifying for subsidies and the amount paid is frequently less than the proportion of total costs authorized as a maximum. In certain special afforestation districts, primarily in western Norway, subsidies of one-half the cost are specifically provided. During 1952 the total qualifying regeneration work on private forests amounted to 6.4 million kroner ($898,000), while the subsidies totalled 2.3 million kroner ($322,000) or 37 percent. However, these subsidies were distributed so that special coastal districts received the authorized 50 percent of costs, while the general forest districts averaged only 14 percent (Skogdirektøren, 1954).

Subsidies for ditching and drainage work are handled in a similar manner. In 1951 the cost of qualifying work of this type on private forest land was 1.4 million kroner ($203,000), while subsidies came to 0.3 million kroner ($47,000) or 23 percent (Statistisk Sentralbyrå, 1954).

The first state assistance in the construction of forest roads was started in 1932-33 as a part of the program of unemployment assistance. Since 1936-37 a separate item for forest road building has been included in the national budget. Subsidies for building forest roads on private land are administered in the same manner as the investment deposits. For the working year 1953-54 the costs of qualifying summer road construction in private forests was 9.3 million kroner ($1,303,000), while subsidies totalled 2.2 million kroner ($310,000) or 24 percent. Winter road costs were 0.5 million kroner ($66,000) with subsidies of 0.1 million kroner ($19,000) or 29 percent (Statistisk Sentralbyrå, 1955).

There has been a pronounced upward trend in the amounts of these subsidies during recent years. Subsidies for drainage and regeneration rose from 0.7 million kroner ($98,000) in 1947-48 to 3.2 million kroner ($449,000) in 1953, while those for roads rose from 1.1 million kroner ($151,000) in 1947-48 to 2.4 million kroner ($329,000) in 1953-54.

Credit arrangements. Adequate credit facilities are important for forest management as for other commercial enterprises. Operating credit is needed primarily in connection with the logging and marketing operations. Long-term credit facilitates investments designed to increase future forest growth. Both short-term and long-term credit based on the forest as security may be helpful in reducing the pressure to liquidate the investment in the forest in order to meet various financial problems of the owner. However, certain of the characteristics of standing timber involve special problems for the security of loans and frequently forest credit has not been available. This has been true in the United States, where special credit facilities for forests have not been developed and where up until 1953 banks belonging to the Federal Reserve System were not permitted to recognize timber as a basis for loans. In sharp contrast with this situation, in Norway forest credit is available from private, cooperative, and public agencies and represents an important economic institution favoring forest management on small woodlands.

Recognizing the problems of credit, especially in rural areas, the Storting passed a law in 1851 providing for the organization of credit associations (Grimley, 1950). This law, although considerably modified by the law of 1907, established the basic principles which are followed at present. For many years, however, there was very little interest in the establishment of rural credit associations because during 1851 the Storting also established the Royal Norwegian Mortgage Bank *(Kongeriket Norges Hypotekbank)*, a publicly-owned

institution founded to provide credit on a mortgage basis for both urban and rural properties. In appraising rural property as a security for loans, this bank includes the value of the forest. Thus the bank is a source of forest credit.

The Mortgage Bank is a source of long-term credit only. In the past loans were made for periods up to 52 years, but at present all are on a 40-year basis. Repayment of loans is on an annuity basis, with a constant total of interest and principal being paid each six months. However, the bank will accept advance repayment of the loan without penalty. The rate of interest on the loan is guaranteed for the entire period of the loan.

Loans are granted on a first priority basis only and are limited to 60 percent of the appraised value of the property. The applicant for a loan is required to submit detailed information concerning his property, including data on valuations for other purposes such as insurance and taxation. The property is then appraised by a district appraiser and a local appraiser working together. The district appraiser covers a major region, while local appraisers are appointed for limited areas only. These appraisals require a description of the forest, information on logging costs, and an estimate of growth. The appraisals are reviewed and may be changed by experts in the Oslo office.

As an old and well-known institution the Mortgage Bank attracts many borrowers. Moreover, since the bank obtains its funds from the government it has usually been able to charge interest rates somewhat lower than those of competing agencies. However, the ability of the bank to provide credit has been limited by the amount of capital grants which it has received. A considerable backlog of applications has often resulted in substantial delays in the granting of loans. Recently this delay has been about eight months. In addition, in its earlier period the bank sometimes found it necessary to limit the maximum amount of individual loans regardless of the value of the security. Such limitations are no longer in effect. Due to such factors the Mortgage Bank has not been able to fill all needs for rural and forest credit.

The commercial and savings banks are also available as sources of credit for forest operations. Both short-term and mortgage-type loans can be obtained from these private banks. The operations of these banks, however, are not designed for the efficient handling of rural and forest credit needs, and in practice they have not been a major source of credit for forestry purposes.

The inadequacies of existing credit sources led the Norwegian Farmers' Union *(Norges Bondelag)* to inaugurate studies of the need for a rural credit society. The Norwegian Credit Association for Agriculture and Forestry *(Norges Kreditforening for Land- og Skogbruk)*, usually referred to as the Rural Credit Association *(Landkreditforeningen)*, was organized in 1915. As a credit association specifically intended for forestry as well as agricultural purposes, this association is of particular interest in this study.

Based on similar organizations in Denmark the organization of the Rural Credit Association (Norges Kreditforening for land- og skogbruk, 1954) corresponds roughly to that of the Federal Land Banks in the United States. All borrowers and only the borrowers are members of the association. Each *fylke* in which there are at least 50 members constitutes a representative district. It elects a representative for a 3-year period at a district meeting. The Board of Representatives meets annually in Oslo. The Board of Directors of the association consists of three members elected for 3-year periods by the Board of Representatives and an administrative director appointed by the Board of Representatives.

The association obtains its funds for loans by the sale of bonds in the open market. Special legislative authorization provides that the bonds can be made out "To the bearer," making them readily negotiable. The life insurance companies have been of

especial importance among the buyers of the bonds. Recently the Central Bank was authorized to control the total volume of these bonds, but so far this authority has not been exercised.

The association is organized to make loans for intermediate and long periods for all agricultural and forest properties in Norway. The entire property serves as security for the loan, but many of the loans are made on properties consisting solely of forests. There is no maximum on the amount of the loan (assuming the security is adequate) and loans as large as 6 million kroner ($840,000) have been made. The principal types of loans are for 15-year and 54-year periods. Both the period of the loan and the interest rate are guaranteed. Loans can be made up to 60 percent of the appraised value of agricultural and forest lands and up to 40 percent of the appraised value of buildings on these lands.

At the time the loan is granted, 2 percent of the amount must be paid in to the association's reserve and adminstrative funds. In addition, a further charge of 0.1 percent of the amount of the loan outstanding must be paid each six months. This charge is the source of the association's operating funds.

The rate of interest charged for new loans has changed over time. In 1946 the rate for long-term loans was 3 percent; from 1948 to 1951, 2½ percent; in 1952 and 1953, 3 percent; and since 1954, 3½ percent. In addition, there are charges against a loan which are tied to the particular series of bonds which are the source of the funds. These bonds are sold at discount, and the same discount factor is charged against the loan. For example, in the spring of 1955 the series 7/2 bonds bearing 3½ percent interest were selling at 98½ percent of face value. Thus, after making the 2 percent payment to the reserve fund and having his loan discounted at the same rate as the bonds, the borrower would obtain only 96½ percent of the stated amount of his loan.

Repayment of the loans is based on the annuity principle. Equal payments at six-month intervals are made, amounting to 2.17 percent of the nominal value of the loan for 54-year loans based on the series 7/2 bonds.

In the early years of the association only the value of the ground and the young trees was considered in the appraisal of forests as security for loans, since it was felt that mature trees were not a sufficiently permanent asset. At present, however, all trees are included in the appraisal. Officers of the association believe that the Forest Protection Law of 1932, with its provisions restricting the cutting of young timber and requiring advance notice of any cutting, has greatly improved the status of timber as a security for loans.

The method of valuation is based on capitalizing the product of the estimated growth on the property multiplied by the estimated trend value of stumpage. The capitalization rate used is 5 percent. Using a stumpage value of 18 kroner per cubic meter ($0.072 per cubic foot) as representative, the formula can be written:

$$\text{Appraised value} = \frac{\textit{Estimated growth} \times \textit{18 kroner}}{.05}$$

In some cases an additional allowance is made for the current sales value of merchantable timber. When this is done additional precautions are taken to ensure that adequate security is maintained for the loans. Statements of cutting plans may be required; checks may be made through the regional timber sales associations; etc. In all cases the borrower is required to carry fire insurance on his timber.

All loans are handled by the central office in Oslo. The association has four local appraisers in each district, who work on assignment as required. Qualifications of these local men are not standardized, the effort being simply to get the best qualified men available. Any appraisal is made by two of these men working together. The appraisal report is submitted on standard forms. Since operating costs must be held at a low level, appraisals of

forest properties are based on inspection rather than on detailed surveys. However, if the owner has the results of a detailed survey this material is submitted with the report.

The local appraisal is then sent to Oslo for review and adjustment by the association's chief appraisers who are led by a forestry graduate with many years of experience. The detailed reports of the national forest survey have been found useful as a check on the reasonableness of the reported forest conditions. The chief appraiser can change either or both the estimated growth or the assigned stumpage value.

The Rural Credit Society grants loans only on a first mortgage basis. Second mortgage loans are provided by a closely related but independent organization established in 1942, the Norwegian Rural Mortgage Association *(Norges Landhypotekforeningen)*. The maximum period of amortization of these loans is 30 years. The first and second mortgage loans combined are limited to 67 percent of the appraised value of the property.

The need for operating credit in forestry in Norway has involved special problems. There is a very pronounced seasonal pattern in the demand for operating credit, usually beginning with the main logging season in November or December and extending for a period of 3 to 6 months. Savings banks have not been particularly interested in loans in this area, since this seasonal pattern does not fit into their needs. In the past forest owners commonly obtained operating funds for logging through partial payment in advance from the buyers. This, however, left the sellers in a very weak bargaining position. Consequently an urgent need for other sources of operating credit was felt, especially with the development of the regional timber sales associations.

Recognizing the general needs for short-term credit in agriculture and forestry, the Rural Credit Society established The Central Fund for Rural Working Credit *(Centralkassen for Bøndernes Driftskreditt)* in 1925 as an independent cooperative association. Although the Association provides short-term credit for both agricultural and forestry purposes, in practice its greatest activity has been in forestry. Of 130 million kroner ($18,200,000) in loans granted during its first 24 years of operation, 119 million kroner ($16,700,000) were used to finance forest operations (Grimley, 1950). This association obtains its funds for loans from the Bank of Norway *(Norges Bank)*. For forestry purposes, the loans are made through the medium of the timber sales associations, which in turn advance the money to the individual sellers.

These various cooperative credit associations appear to have been very effective in meeting the needs for forestry credit in Norway. Their success is attested by the large and increasing volume of their transactions. It is of interest to note that there has been no element of public subsidy in this method of providing forestry credit. Indeed, the state might be considered as a competitor of the cooperatives through the medium of the Royal Norwegian Mortgage Bank. It may also be noted that there is no provision for deferred payments or similar special devices which have sometimes been recommended to encourage forest management.

The role of the cooperatives has been to provide an efficient and safe procedure through which ordinary investent funds could be channeled into forest and agricultural areas. By this special institutional device, ordinary credit sources have been made available for forest management on small and large woodlands in Norway.

Insurance. An important deterrent to forest management on small (and large) forest properties in many regions has been the risk of financial loss through the destruction of growing stock and merchantable timber by various natural agencies, including fire, insects, disease, wind, and storms. The danger of loss from fire has been a particularly important financial problem for forest management due to

high degree of exposure to fire which has been common and to the risk of sudden and concentrated loss which fire involves. For most economic activities the incidence of such concentrated losses is spread over a wide area through insurance.

In Norway forest fire insurance has been available since the establishment of the Norwegian Mutual Forest Fire Insurance Company *(Det norske gjensidige Skogbrandforsikringsselskap)* in 1912 and is widely held. Insurance against loss from other natural agencies is not available. However, the danger of concentrated loss from such agencies is extremely low under Norwegian conditions except in special conditions in limited areas and is not generally considered to be a financial problem in forest management.

Any consideration of forest fire insurance in Norway must be set in terms of the fire problem of the country (Nygaard, 1951b). Although natural conditions in Norway favor effective fire control, in the past frequently no effort was made to control fires. As a result extensive areas were burned. The law of 1893 authorized each *herred* to establish regulations dealing with fires; the establishment of the Mutual Forest Fire Insurance Company in 1912 provided an agency which was effective in working for better fire protection; and the law of 2 July 1921 established uniform and effective rules for fire control in the entire country. Under these developments and with a fire protection organization that would be considered rudimentary in most forest regions of the United States, a very effective level of fire protection has been achieved. Official statistics (Statistisk Sentralbyrå, 1954) show that a total of 15,504 acres of productive coniferous forest burned in the period 1921-51, or only 500 acres annually for the 31-year period.

It is interesting to note that fire protection is regarded as a local matter rather than the responsibility of the public forestry organization. The *herred* is divided into fire districts, each with a fire warden. A fire chief is appointed for the entire *herred*. These men serve without pay and are authorized to call out all able bodied men in the *herred* for forest fire fighting without compensation.

It should be added that even on the small area of productive coniferous forest which burns, the loss due to the fire is limited. Timber of merchantable size which is killed can be sold at prices practically the same as those for live timber, providing that it is cut before blueing sets in. Thus the loss consists primarily in the killing of young growing stock and damage to the soil.

Insurance against these losses is provided by the Norwegian Mutual Forest Fire Insurance Company (Nygaard, 1951a). Since the risk of loss is concentrated in the young timber, the insurable values are limited to the smaller trees, usually up to 6 inches in diameter. The owner supplies all necessary information concerning the forest in making out the application for insurance. The owner's estimate of the average values per acre of the different parts of his forest are accepted and the amount of insurance carried is determined by the owner's decision.

The premiums are held in a capital fund, the interest on which is used for the operation of the company. The premium schedule was developed through experience. When the company began operations in 1912, an annual rate of 1.25 per mille of insured value was established. With accumulating experience this was progressively lowered. After 22 years of premium payments it was found that no further payments were necessary. Thus in 1924 a system of "perpetual insurance" was started. A single payment of 18.3 per mille establishes the insurance for all time. This can also be paid at the rate of 2.1 per mille for 10 years or 1.1 per mille for 22 years.

In the appraisal of damage, a 100 percent inventory is made of the burned area. From this the loss in growth rate of the killed or damaged trees of insurable size is estimated. The current stumpage rate is used to estimate the value of this growth,

and the product is capitalized at 4 percent as the measure of damage. The appraiser also estimates the relationship of the insured value to the actual value for the entire property covered by the policy and the coinsurance principle is used in payment of compensation.

Until 1952 practically all claims were handled by a single appraiser employed by the company. Since his retirement in that year, they have been handled through independent consulting appraisers.

Insurance in the company is now carried on about 80 percent of the privately-owned productive coniferous forest area. In 1950 the insurance in force totalled 522 million kroner ($104,500,000) and the capital fund was 9 million kroner ($1,300,000).

Although the insurance company is not a major source of forest credit in Norway, it is of interest to note that 95 percent of the capital funds are invested in loans on forest land. Loans are callable on 6 months notice, but loans made as far back as 1920 are still in effect. Foreclosures have been necessary in only two cases and no losses have been suffered.

Technical Advice and Assistance

The management of a forest property involves a complex of biological, engineering, and economic considerations extending over a long period into the future. Fully effective forest management requires the guidance and direction of a forester with professional education and experience. On large forest properties, whether in private or in public ownership, such professional direction is obtained primarily through the employment of a staff of foresters on a full time, permanent basis.

On small properties, however, the problems of obtaining adequate professional services is more difficult. The extent of such services which are needed on the individual property are not sufficient to enable the employment of a full time forester nor to justify the owner in developing the necessary professional skills himself. Moreover, an area in small ownerships represents a more difficult and complex problem in technical forest management than does an equal area in large holdings. With the complicated pattern of ownership boundaries and very small cutting units, the development of an equal level of technical direction would require a proportionately larger amount of professional work on small holdings than on large ones.

If an area of small woodlands is to receive professional forest management without modifying the ownership pattern, it is necessary to develop some method for providing for the services of professional foresters who will work for a number of different owners rather than for only a single owner. Several such methods have been developed in Norway.

The public program of service forestry. The system of forestry boards and their employees established under the Forest Protection Act of 1932 is an important source of technical assistance to woodland owners. The *fylke* forest societies, boards, and forest officers and also the *herred* forestry boards all perform an effective general educational and advisory function. In terms of direct services to the small woodland owner, however, the *herred* forest inspectors are the most important element in the system. With the emphasis on education and service in the administration of the act, it is considered a primary function of the *herred* forest inspectors to provide advice and guidance in marking timber for cutting, in planning cultural and investment work, and in other forestry problems. Moreover, the act specifically provides that the owner can demand that the marking be done by the public authorities. When marking or other forestry work is done directly by the *herred* forest inspector or similar officer, the law requires that the owner pay for the service performed.

The *herred* forest inspector is a salaried employee who is also reimbursed for his transportation costs, but he receives no allowances for meals or lodging when traveling. To meet these expenses he may

charge the owner from 25 to 30 kroner per day (about $4.00) when marking trees for cutting or doing similar work. Such charges are considered a private arrangement between the owner and the inspector.

In practice, much of the marking is done by men specifically approved by the *herred* forestry board to assist in this work. These men do not receive pay from the board and are not considered as legal employees of the board. In 1955 they charged the owner 40 kroner ($5.65) per day for marking, but it was reported the rate might soon be raised to 45 kroner ($6.40).

Generally this program of public assistance is concerned with specific operations on the forests. The inspectors and their assistants do not ordinarily provide any detailed assistance in the overall planning of management, the development of working plans, and similar matters.

Working plans from the Norwegian Forest Society. A program of providing professional services in the preparation of working plans for small woodlands has been developed by the Norwegian Forest Society *(Det Norske Skogselskap)*. Established as a private organization in 1898 to work for the improvement of forestry in Norway this society has played a very important role in all phases of forestry since that time. Although still essentially a private organization, it has some quasi-public attributes in that it receives financial support from the government and one member of the six-man board of directors is selected by the Ministry of Agriculture. In addition, the affiliated *fylke* forest societies are directly provided for in the Forest Protection Act of 1932. The society performs a general forestry extension function, publishing two forestry magazines and various books and pamphlets, organizing forestry programs, assisting in various meetings, and so on.

In addition, since 1942 the society has maintained a working plans division with a staff of foresters whose function is the preparation of working plans for farm forests (Kierulf, 1946; Ludvigsen, 1948). These working plans include a general inventory of the property, a contrast of actual with normal conditions, a general plan for handling the property, detailed recommendations for cutting during the next ten years, and a system of records for the owner. The charge for such work has been deliberately held at low levels and a portion of the costs of the program has been paid from the general funds of the society. During 1954 plans were prepared for 508 woodlands.

While this program has expanded substantially over the years, there does not appear to be any present plan to expand the program to cover the majority of woodlands. Instead, the society appears to regard its work in the field as a pioneering effort intended to develop the methods and demonstrate the feasibility and usefulness of working plans for small woodlands.

Management services under the Forest Owners' Association. The Norwegian Forest Owners' Association and its affiliated district sales associations are also important as a source of professional management services to the small owner. As has been discussed earlier, the marketing services which they provide as their primary function is of great assistance to the small owner in meeting his marketing problems. In addition, the association publishes a magazine for its members and carries out some general educational activities. Several of the district associations employ forestry consultants for general work with their members and to perform direct services on a fee basis. These programs have emphasized logging practices, assistance in cutting logs to obtain the maximum values, and similar matters. However, this work has recently been expanded to include the preparation of working plans.

This forestry consulting program under the sales associations is of such recent

development that it has not yet had the opportunity to demonstrate fully its effectiveness or to determine the direction which it may take. Although the degree of interest in such work is extremely variable among the different sales associations, the possibilities for developing a program of forestry services under a sales association are indicated by the recent work in the *Lågendalen Skogeierforening*, an association in southern Norway. Here the concept is developing that the work of the association should embrace two main fields: the business or marketing services and the technical or forestry services. The forestry services are being developed under the forest consultant of the association, a forestry graduate with a wide background of experience.

The forestry work is divided into three sections. One section has as its primary function the preparation of working plans. In 1955 this section included five crews, each consisting of two graduates of the lower forestry schools. The plans prepared by these crews include an inventory of the property, a contrast of actual with normal conditions, a general plan for the property, detailed recommendations for cutting during the next ten years, recommendations for cultural and improvement work including proposals for the use of the required deposits, and carefully prepared working maps. The purpose of the plan is to provide detailed technical guidance for the management of the property during the next ten years. The charge for the work is 11 kroner per hectare ($0.62 per acre). Although preliminary plans for this program were started in 1952, the working program was not established until May, 1954.

A second section consists of crews of forest workers to carry out cultural and improvement work for the owners. Five such crews had been established by 1955. Much of this type of work must be done at a time of year when the farm forest owner is busy with agricultural work and there is a distinct shortage of labor in Norway. Thus the development of crews of trained workers who are readily available should facilitate the carrying out of such work.

The third section is concerned with the rationalization of logging. In 1955 this involved only one lower forestry school graduate with special training in logging techniques.

The effectiveness of such work has not yet been fully tested by experience and most of the sales associations have not yet moved toward such comprehensive programs. Up to the present, however, the achievements show the possibility that the sales cooperatives may become complete management services for the small owner, providing whatever degree of technical, engineering, and labor services he may desire in addition to the marketing of the forest crop. If this possibility is realized the program may become the most important means of providing technical direction for small woodland management in Norway.

Consulting foresters. There are a number of independent forestry consultants in Norway who will provide professional services to any forest owner on a fee basis. These men are generally licensed by the government as *autoriserte skogtaksatorer* (authorized forest appraisers).

Inventories prepared by such licensed appraisers must be accepted as the basis of taxation appraisals and for other legal purposes. While the work of these men emphasize inventories and appraisals, many of them also provide other forestry services. In practice their work is generally with the larger ownerships, but they are available for the small owner who is willing to pay for such services.

Summary

In practically all of the western nations small woodlands receive the poorest forest management of any of the broad classes of forest land. The technical, economic, and social problems of developing good management on such small holdings are among the most difficult problems faced by fores-

ters. In approaching these problems in the United States, it may be useful to study the experience of other nations.

Norway is a significant area for such a study due to the great importance of small woodlands to that nation. The forests and forest industries play a basic role in the nation's economy and export trade. Norway has more than 80 percent of its productive forest land in private ownership, a higher percentage than any other nation with a major forest products industry. Furthermore, the main part of these private lands are in small holdings. The system of small ownership of farm and forest land in Norway extends back over hundreds of years. It is one of the foundations of the existing social structure and economic organization of the country. If the forests are to continue to contribute to the expansion of the Norwegian economy without any major changes in the traditional ownership pattern, then Norway must solve these difficult problems of small woodland management.

On the basis of the historical experience with their forests and various research studies, Norwegian foresters generally have concluded that reasonably full production from their main forest types can be obtained only by even-aged silvicultural practices. This decision to practice even-aged forestry is significant, because it has often been argued that it is difficult to meet the owner's need of annual income if clear-cutting silvicultural systems are applied to small woodlands. In addition, the older diameter-limit or dimension cutting system is still commonly applied on small woodlands. Thus the problem of small woodland management in Norway is not simply one of improving present management, but instead commonly involves a complete reorganization of management practices.

In organizing the management of individual properties, Norwegian foresters make use of a system of cutting classes rather than individual age classes. This has the advantages of simplifying procedures and of being more realistic in terms of actual conditions on the ground. In practice the greatest difficulty with the system has been found in the very high proportion of the forest area which is so irregular in condition as to fall into a single, undesirable cutting class. Use of this catchall classification for undesirable stands results in a lack of sufficient information for management decisions in the areas which are technically the most difficult.

If the institution of private ownership of small properties is to be maintained, public policy to improve forest management must take the form of developing appropriate institutions to enable, encourage, or enforce the desired management practices on these small holdings. The Norwegian approach to this problem involves four main elements: (1) public regulation of private forest management, (2) a cooperative marketing system for logs, (3) various special financial arrangements, and (4) the provision of technical services and advice. The first two are perhaps the more basic, in that they tend to make forest management necessary and economically desirable, while the second two help to put the program into effect. No single element should be considered as dominant, since all parts complement and supplement each other.

The Forest Protection Act of 1932 has often been described as the central element of Norwegian forest policy. Basically a strong regulatory law, it requires notification of intent by the owner prior to cutting and provides for direct intervention by the public authorities under certain conditions. Although the law places the power for a high degree of control of private forestry in the hands of the government, in practice the administrators of the law have stressed education and service rather than use of the police power. In its original form the law provided for a remarkable blending of private and public agencies in the system of boards administering the acts. This appears to have been very effective in gaining general understanding and support for the measures. Thus it is of particular interest to note that through

successive amendments the role of private interests has been progressively reduced.

The act gives a large amount of discretionary authority to the administrative agencies which it established. Under the democratic conditions prevailing in Norway, this seems to have led toward somewhat weak enforcement rather than toward abuse of power. Current proposals for new legislation require a positive program of increased forest production rather than simply the protection of existing forests. Thus it is anticipated that the amount of discretionary power will be reduced. In general, there is a clear and continuing trend toward more intensive regulation of private forest practices.

The marketing arrangements for forest owners appear to be fully as important a part of the institutional environment affecting forestry in Norway as the regulatory legislation. In common with a number of other European nations, Norway has established price tables for various sizes of top-measured and middle-measured logs. From the standpoint of the small woodland owner, this system has the advantage of ensuring higher prices for the larger and better quality logs, although the system does appear to involve the danger of some inflexibility in price relationships. The most interesting of the details of this rather intricate system is the use of taper as an indication of log quality.

A far more important aspect of the marketing institutions is the primary role played by cooperatives. The Norwegian Forest Owners' Association and its affiliated district sales associations control the major part of the supply of market logs. This system of cooperatives has developed into a very effective and powerful marketing agency for the woodland owners. In assessing the success of the forest marketing cooperative, however, it is important to recognize that the problem which it has solved for the owners is that of providing strength in reaching existing markets—not the very different problem of establishing new markets.

As a somewhat surprising consequence of the success of this cooperative movement, there has developed definite monopoly strength on the part of the sellers which has been countered by further centralization of action by the buyers. In this bilateral monopoly situation, the government has played an important, if usually indirect, role in price determination with a resultant introduction of political as well as economic considerations into the negotiations.

The most interesting of the financial institutions affecting forest management is a distinctive Norwegian contribution to the practices of forest policy—a system for forcing investment into forest management. This is achieved by withholding a portion of the sales price of the logs in the form of cultural deposits and investment deposits which are repaid to the owner as reimbursement for certain approved activities in regenerating the stands or in capital investment in the forest property. This can be considered as an extension of the regulatory approach, but it involves a regulation of the use of a portion of the income from the property rather than the usual regulation of practices on the ground. For a number of years repayments from these deposits were far less than collections and large balances were built up. However, the rising trend of repayments indicates that the system is gradually becoming highly effective in channeling funds into forestry.

In addition, Norway maintains an active program of direct subsidies for planting, drainage, and the construction of forest roads.

There are also excellent facilities for both short-term and long-term credit for forestry purposes. Although both public and private banking facilities provide credit secured by forest properties, this is another area in which cooperatives have been very effective in meeting the needs. Of particular importance in this regard are the programs of the Norwegian Credit Association for Agriculture and Forestry in pro-

viding loans for periods up to 54 years and of The Central Fund for Rural Working Credit in providing operating credit for the logging and marketing period.

The final element in the important financial institutions is provision for forest fire insurance. This is provided by another cooperative organization, the Norwegian Mutual Forest Fire Insurance Company. This cooperative has operated successfully for more than 40 years, but it must be recognized that fire danger in Norway is very much less than in most parts of the United States.

Provision of technical advice and assistance is perhaps less fully developed than the other elements of Norway's approach to small woodland management. This is to be expected, since an active operating need for such advice and assistance can become felt only after other factors have led the small owner to move toward intensified forest management. The various forest inspectors operating under the regulatory legislation actively provide the owners with advice and assistance on various specific operations. The Norwegian Forest Society has carried out a pioneering program of furnishing professional management planning for small woodlands through the device of written management plans. Recently some of the cooperative district sales associations have undertaken similar working plans programs in their own districts and there are some indications that these cooperatives may provide general forest management services in the future as well as marketing services.

In general, Norway appears to be seeking a middle way in ensuring the future productivity of its forests. The existing pattern of private ownership is being maintained, but the rights involved in title to the land are being reduced. In part this reduction of the rights and free choice of the owner results from individual, voluntary association with cooperatives to gain strength in marketing and to provide the security of large numbers in credit and insurance. In greater part, however, the reduction in ownership rights appears to be the result of governmental regulation.

If it be granted that an improvement of forest management is desirable, then any course of action followed must involve a balancing of advantages and disadvantages. The Norwegian methods appear to have the great advantages of maintaining established social institutions and of continuing the benefits which come from operation by the owner. The principal disadvantages are the need for an elaborate system of controls and the maintenance of a highly complex structure without the economies of large-scale management.

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